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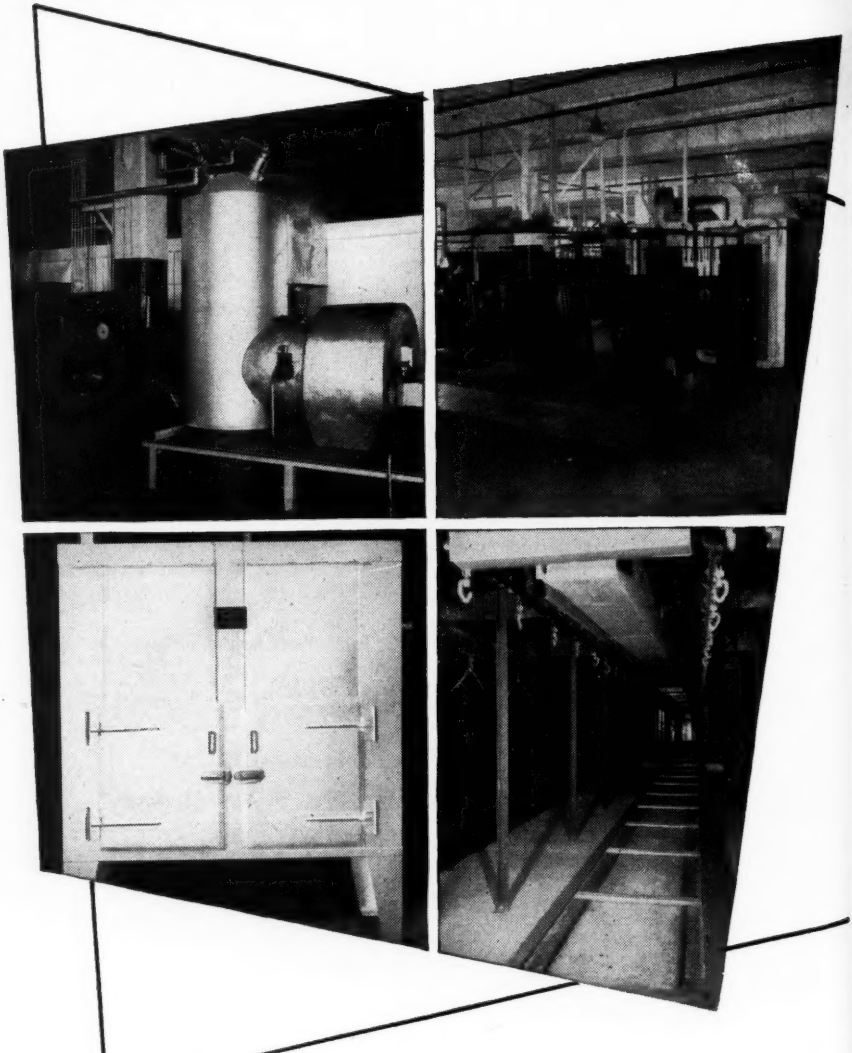
INDUSTRIAL OVENS



Products Finishing

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We all know that finishes may not always do everything that is expected of them. But granting the manufacturer is a reliable one and knows his business, many finishing failures may occur for the following reasons: (1) the finish manufacturer did not know all the facts in the case and submitted a finish that was unsuitable for the application; and (2) the user of the finish, through ignorance or carelessness, applied the finish on products or in ways for which it was not intended, and thus subjected it to conditions for which it was not designed.

In purchasing finishes, the user should have personal contact with the representative of the supplier of the materials required and work out with him the best solution for each finishing problem. In other words, the metal finisher of today cannot know all he ought to know about the finish he is using. The composition has become too complex and varies too widely for that, since most modern finishes are developed to meet specific conditions.

In the finishing department, producing goods with attractive, durable finishes at a reasonable finishing cost per unit is all-important. To produce the best work at the lowest cost, effective use must be made of the wide variety of modern lacquers and enamels that are available. Since the number of highly specialized finishes has become so great and the requirements of each product to be finished are so exacting, it has become impossible for one who is not an expert in this field to select the finish that will provide the best possible results in a given case.

The production man in the finishing department will do well to ally himself with a manufacturer of industrial finishes who is in position to study his problems as they arise and who, by working with him continuously, can give him assurance that his finishing is being done in the most efficient manner at all times. Fortunately, most reputable manufacturers of metal-finishing materials keenly feel their responsibility in this matter.

Automatic Temperature Control in the Finishing Department

By FRANK V. FAULHABER

SPECULATING and chancing on finishing department operations can be decidedly dangerous and costly. Many a finishing foreman has rued the occasion where an uncertainty that crept in damaged an entire run of work. Times innumerable, if the completed work was not absolutely damaged, the product in no sense of the word could be termed meritorious. More likely, it reflected detrimentally on the firm's reputation. Such uncertainties are particularly prevalent when a finishing department operates equipment lacking proper checking apparatus, such as automatic temperature control instruments.

Adequate checking equipment is ever vital and important with any plant, and particularly so where volume output and uniformity of production is sought. It is doubly paramount currently, what with the ever-changing personnel and the repeated need for breaking in new operators. A notable instance is in connection with plating operations, where a suitable temperature controller is especially desirable. The man charged with responsibility can set the controller for the preferred operating temperature, certain that the required bath conditions will be maintained without his further supervision. Moreover, the controller's chart will provide him with an accurate, dependable record of operations throughout the day.

Aside from stabilizing operating performance and making for uniform plating results, a temperature controller is markedly helpful in increasing production and lowering operating costs. With the operating layout otherwise efficient, there will be greater uniformity in workmanship with automatic temperature control. There will be fewer rejects and "doubtfuls" among the plated units; besides, less time in inspection is entailed. Additionally, since no hand operation of valves is required, the workers have more time for loading and unloading the baths and for putting the product through the other necessary processes.

Pronouncedly, the increasing importance of specification plating is an unshakable reason for automatic

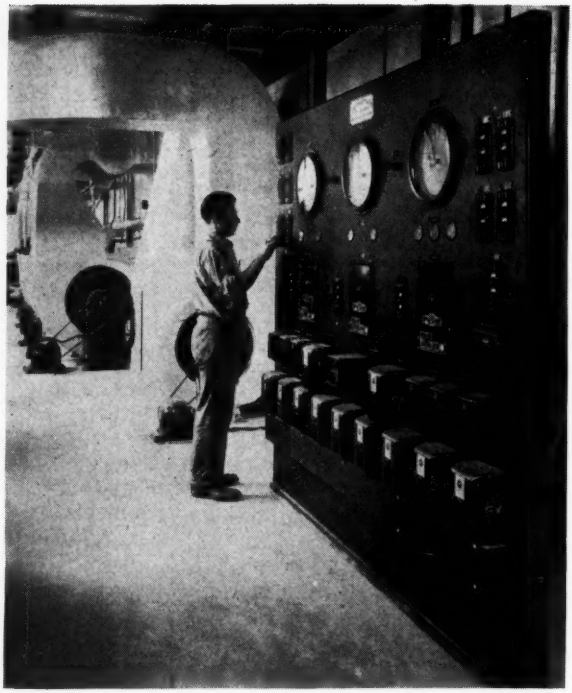
temperature control. Bear in mind, desired thicknesses and finishes can be achieved on successive jobs **only** when the operating conditions are exactly duplicated. Fortified with a controller chart for a guide as to the conditions established for the preceding job, duplication is easy, precise, sure.

A controller performs its work automatically. It is there, fixedly, on the job, never being called away, nor tiring or forgetting. The bath temperature is brought up to the working point each morning in the minimum of time, and without over-runs. That temperature, moreover, until operations cease, is maintained exactly, with no wide fluctuations and with no waste of steam or cooling water.

In objectifying for exemplary plating performance, bath current density, solution strength and bath temperature all must be correctly maintained. Two of these variables are quite easily regulated. The tank rheostat can be set for the desired current density and forgotten, so long as the bath is operating under reasonably constant conditions. The plating solution, likewise, when handled with reasonable care, may be used for months and even years with little attention except for checking of the solution strength and occasional corrective additions.

The correct operating temperature for most baths, however, is within a range of a few degrees and, without continuous control, variations may readily go beyond this narrow operating zone. The results attending such variations are something distressing. When color-plating brasses and

In this illustration, milk cans are shown being given a coating of tin. To prevent unnecessary loss of time and to provide for its maximum adhesion to the base metal of the cans, precise temperature control of the plating baths is essential.
(Photo courtesy Wheelco Instruments Co., Chicago, Ill.)



The temperature and safety control panel board depicted herein includes three temperature recorder controllers and three safety units. *(Photo courtesy J. O. Ross Engineering Corp., New York, N. Y.)*

●

No matter what type of plating bath is desired, maintaining its proper temperature is an ever-present problem. Toward this accomplishment there are two avenues. Either the management must provide constant attention by plating room operators or appropriate automatic temperature control. For divers reasons, the latter is preferable. Noteworthy, it is easier, simpler, less expensive, and more dependable. Notwithstanding the well-meaning intentions of the most conscientious and experienced employee, lapses are likely because of the human factor, a temperature controller for precision and uniformity of bath temperature assuredly being more reliable.

In large measure the character of bright chromium plating is governed by the correct temperature control, since the bath is of such a nature that the permissible temperature operating range is narrow and critical. A few degrees too high, the bath temperature results in a dull, lusterless plate. Low temperature readily may lead to uneven bath throwing power, and when hard chromium is being plated on tools, low temperature may conduce to hydrogen embrittlement of the steel, with cracking and tool failure a consequence.

bronze, the final color may vary because the proportion of zinc in the plate varies with the temperature. When tin-plating, low temperatures may produce a dull plate while high temperatures may precipitate insoluble tin salts which necessitate draining of the bath and starting anew with fresh salts.

Then again, Rochelle salt baths for copper plating decompose at high temperatures, causing a carbonate formation which reduces the efficiency. When the shop nickel-plates zinc alloy castings, low temperatures may produce a plate which cracks, and high temperatures may induce discoloration and black streaks. In striving for bright plates of copper and nickel, close temperature control is especially imperative if a distinctive lustre and freedom from porosity is the object.

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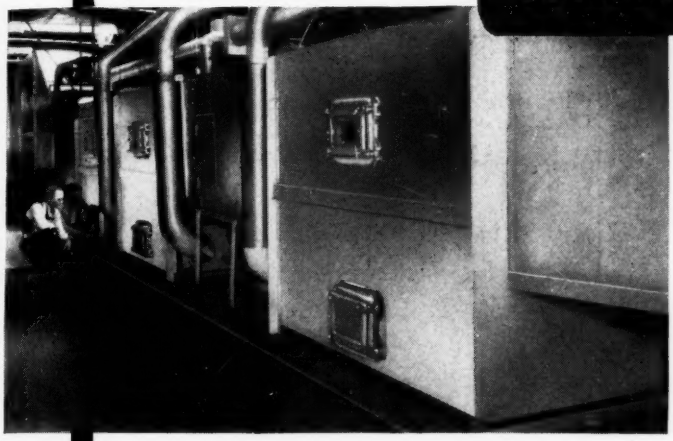

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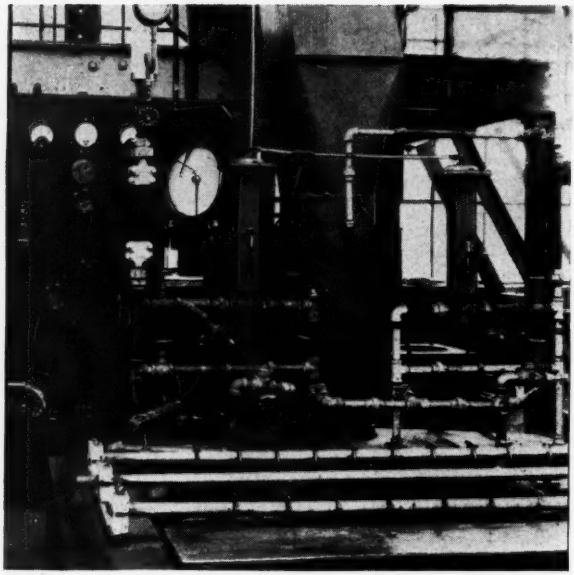

This chromium plating installation includes a recording temperature controller operating two diaphragm valves of different range for controlling and recording both the heating and cooling of the plating bath. *(Photo courtesy Taylor Instrument Companies, Rochester, N. Y.)*

By reason of the comparatively high current densities normally used, chromium baths may sometimes require heating and at other times require cooling, according to the volume of the work load being plated. A representative temperature controller especially appropriate for use in chromium plating and on all high current density baths is one with a recording pen and also two control pointers which establish the temperature limits at which the steam and water valves are operated. Neither steam nor cooling water is used, so long as the bath temperature stays between these limits.

For the most part, such a controller uses steam during only the warm-up period in the morning, and thereafter uses only cooling water. However, on the job plating baths, where the load varies widely, the controller automatically shifts from control of heating to control of cooling, as needed.

With such automatic temperature control there is no possibility of operators forgetting to shut off the steam valve and thereby waste both steam and cooling water all day, or to cause bath conditions to reach the point where cooling water alone will rectify them.

A pneumatic temperature controller designed particularly for plating rooms controls a single valve, which may be either in the steam line or the cooling line, as conditions necessitate. Unusually simple in operation, the worker merely turns a knob, bringing the index pointer to the desired temperature on the chart, and turns on the air supply to the instrument. The operator is now free for other tasks, but the controller will maintain the desired temperature with no further attention, until its setting is changed or the air is shut off.

Some temperature controllers for plating bath applications are available with vapor-pressure type measuring systems. By virtue of this characteristic, a very small change in bath temperature—a small fraction of one degree in the ordinary bath—is sufficient to actuate the control mechanism of the instrument. Aside from this alert responsiveness, the vapor pressure thermal system is well suited for plating applications since its accuracy is not affected by atmospheric temperature either in the plat-

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ing room or at the controller case.

Controllers which provide proportional response or throttling control are recommended for plating bath temperature control. Such recording controllers are built for precision control and for durable service under the most severe operating conditions. All instrument parts within a case are made of materials selected for their resistance to corrosion. The sensitive bulb and its capillary tubing are made of corrosion-resisting alloys as required.

A controller of this type may be located wherever it is most convenient—flush-mounted on an instrument board or yoke-mounted or surface-mounted on wall or column. Its door closes securely to prevent the entrance of dust, moisture and fumes. Its heavy glass is rubber-gasketed, the gasket being easily replaceable when necessary. Since the entire chart record is visible at all times, it provides an ideal operating guide.

There are also recording and indicating controllers that operate valves and other control equipment electrically through a unique rotating contact assembly. As with air-operated controllers, the control assembly is mounted integrally with the pen or pointer, so that the control action is coordinated, at all times, with the temperature measurement. Since smooth contact discs with sliding action are employed in such controllers, a standard temperature measuring element will open and close as many as four electrical circuits, with no appreciable detent or inaccuracy of measurement and without the need for any auxiliary detecting mechanism.

The contacts of such controllers are self-cleaning and positive in action. Relay chatter and the possibility of arcing are eliminated by lock-up circuits. Built-in relays protect the contact assembly from possible shorts or overloads which might occur in the control equipment.

Instruments are available wherein the contact assembly operates one valve or two for heating or cooling, or to operate practically any desired system of signals in conjunction with the contact action provided. Motor-operated valves, electric heating elements or solution circulating pumps may also be operated by such controllers with the use of auxiliary contactors or motor starters.

Relevantly, all commercial steel blacking methods in general use are immersion processes, depending on chemical reaction between the treating salts in solution in the blacking bath and the steel articles being colored. Whenever the bath is properly operated, the reaction of the treating salts with a surface layer of the steel changes it to a stable, corrosion-resisting compound which has a lustrous black finish.

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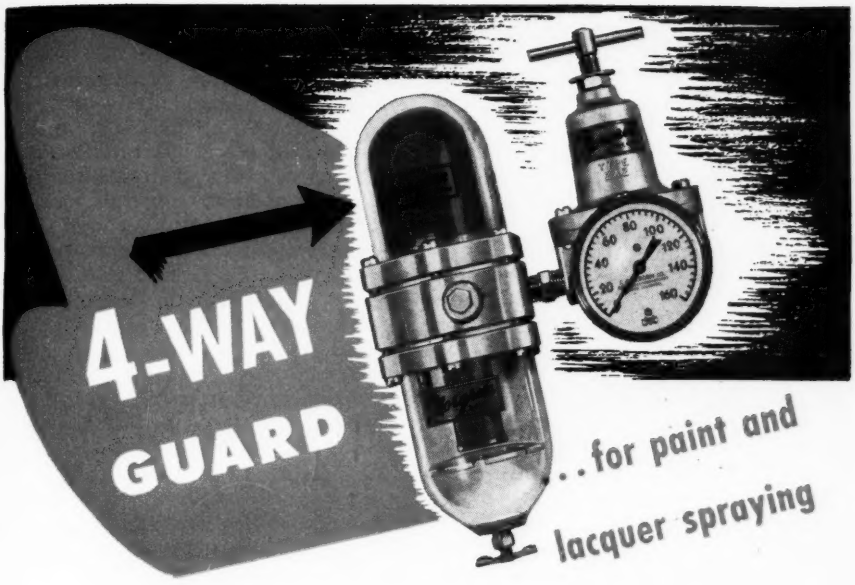

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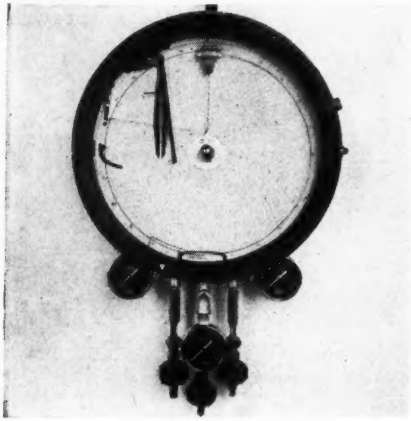
Automatic temperature control in steel blacking processes obviously justifies itself by ensuring continued high production rates, as well as results of uniform high quality. An efficient control system is available which maintains both temperature and concentration of the bath at correct values, automatically and continuously. Therefore, inexperienced workers may process steel articles in quantity, according to time schedule instructions, without rejects and without loss of time resulting from improper bath conditions.



This temperature controller is representative of the type of apparatus required in performing precise and exacting chromium plating operations.

(Photo courtesy The Foxboro Co., Foxboro, Mass.)

Where steel blacking processes are used on dies and cutting tools for friction-reducing properties, automatic control of bath temperature becomes essential if the proper depth of the surface layer is to be obtained on quantity production. Since such a controller adds dilution water in only small quantities as evaporation and dragout cause water losses, losses of treating salts or operating time and dangers to operators, which are caused by boil-overs, all are eliminated.

Although anodic treatment of aluminum is fundamentally different from electroplating processes in that it is the oxidation of a surface layer of the work rather than the addition of a layer of another metal, we nevertheless have here another vital process where automatic temperature control plays an important role. Bath temperatures above the correct operating zone result in a powdery surface unsatisfactory for either a paint base or a final finish. And since the bath tends to heat up in service, automatic control of cooling water flow is usually necessary for both processes.

In operation, a temperature controller, which actuates both heating steam and cooling water valves, serves for the purpose of bringing up the anodizing bath to working temperatures as expeditiously as possible in the morning so that the maximum amount of productive time will be obtained. Such controllers can be used with complete success on both sulphuric acid and chromic acid anodizing. Instruments may be entirely similar, with the exception of the sensitive bulbs and capillary tubing, which are lead-sheathed and plain steel respectively.

Since correct temperature also have a prominent influence in acid cleaning or pickling operations, automatic temperature control equipment here, too, is essential. The correct temperatures expedite such finishing processes, and yet there are temperature limitations which must be recognized. With proper control there is a shortening of pickling time since optimum pickling takes place at one specific temperature for each acid. Savings can be effected materially on steam costs by avoiding high temperatures following the heating-up and during low-load periods. There is also a sav-

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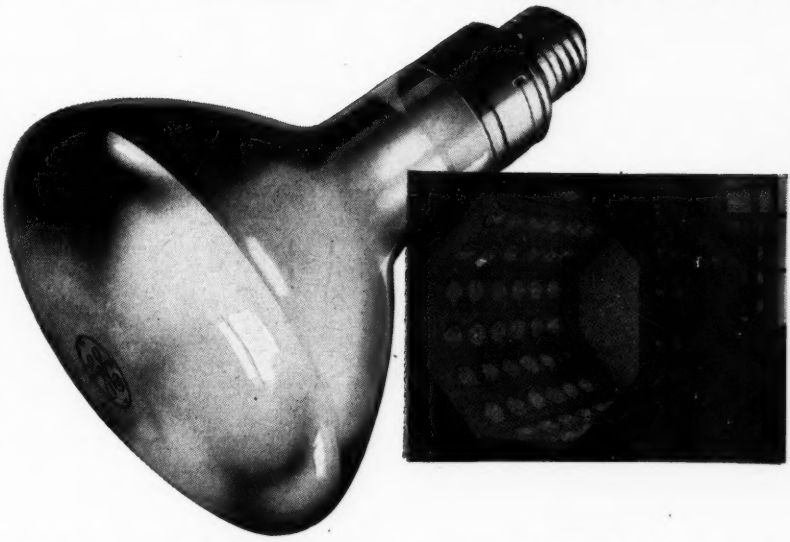

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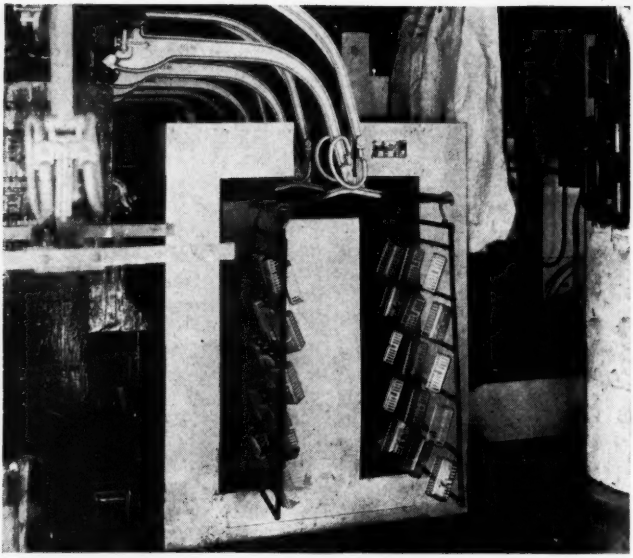


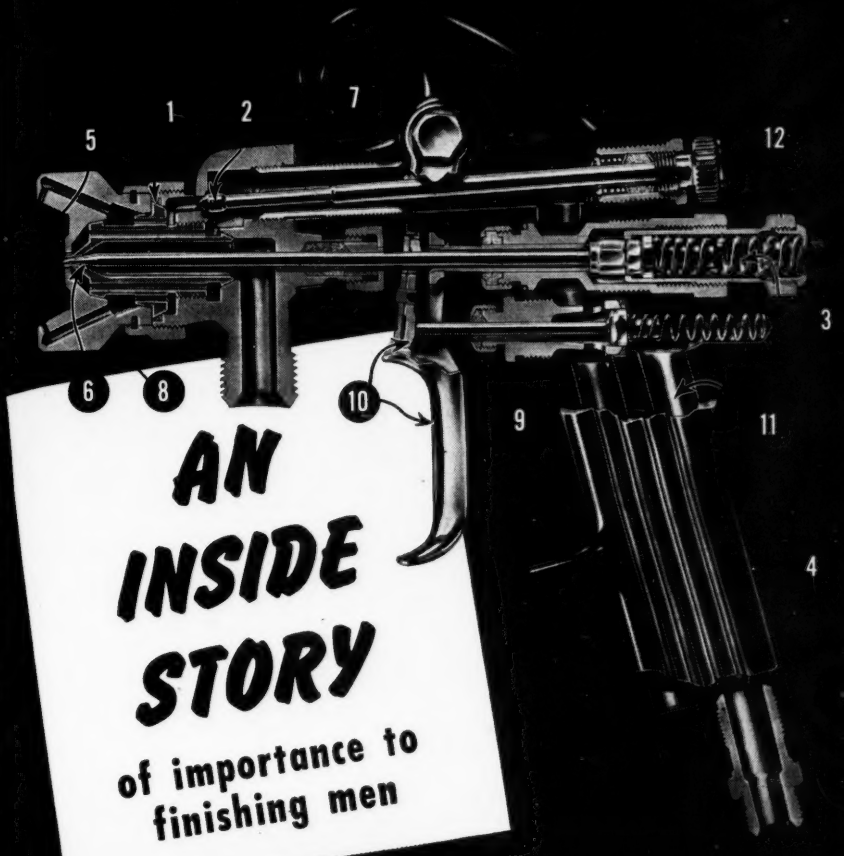
This high-speed drying oven is located immediately at the end of an electroplating system. Horizontal air circulation is utilized to provide a maximum amount of air circulation over the parts so as to afford uniform results as well as fast drying. Visible at the right is a portion of the oven temperature control apparatus. (*Photo courtesy Despatch Oven Co., Minneapolis, Minn.*)

ing of acid which is frequently lost on high temperature evaporation. Savings of time and labor and reduction of injuries to men and machinery breaks, as well as less discomfort to the operating personnel, besides better and more uniformity of pickling, with continuous record for future guidance, are all possible with proper temperature recording control.

Specially protected bulbs and thermocouples to withstand the action of sulphuric acid are available. Where hydrochloric or nitric acid is present in the pickling solution, bulbs and thermocouples with another type of protection have been found serviceable. When temperature controllers and dial-type indicators are made of the proper corrosion - resistant alloys, maintenance and renewal are minimized. The large clear white temperature graduations on the dial units can be easily read from a distance of 20 feet, even in dim light or in steamy and hazy atmospheres. With such instruments there is no occasion for processing work in cleaning or plating baths before temperatures are up to the proper working zone. Moreover, the inconvenience and health hazard of inhaling acid fumes is reduced because operators can read the large indicating dials located at a convenient height, instead of bending over baths to read a glass stem thermometer in the bath.

As many finishing plant executives will readily attest, automatic temperature control apparatus also represents an outstanding feature in industrial finishing ovens. By its availability, there is effected a reduction in heating costs since it prevents excess temperatures. Lower labor costs also result, since there is no necessity for constant watching on the part of employees for maintenance of proper temperatures.

Wherever uniformity of product and large output are the aims, automatic temperature control equipment proves an appreciable factor. The right type of such apparatus is available for practically any finishing equipment, installable at locations befitting any conditions.



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Protective and Decorative Finishes for Aluminum

By RAY SWAN and N. P. RUTHER
Research Staff, The Watson-Standard Company
Pittsburgh, Pennsylvania

THE increasing use of aluminum in all phases of industry and commerce is resulting in the necessity for more flexible and efficient finishes for the metal to make it suitable for an even wider variety of applications. The extreme versatility of aluminum requires coatings to match. Obviously, the most successful finishing system is the one adapted to the size, shape, and use of the manufactured item. There can be very little generalization on the subject of finishing aluminum since the uses for aluminum are so diversified. It is to the fabricator and finisher that this article is directed.

Aluminum, for almost any application, will require one or more of the following types of finishes: a resistant finish to protect it from acids, alkalis, and other corrosive elements; a protective finish to prevent atmospheric discoloration; and a decorative finish to enhance the beauty of the manufactured article. The determination of which of these will be needed must be based on the contents, use, and structure of the item.

Aluminum has certain characteristics which rather complicate the selection of the proper type of coating for protective and decorative purposes. The most satisfactory coating for steel, for instance, will sometimes be entirely unsuitable for aluminum. Certain metallic pigments which have met with wide success on other metals are ruinous to aluminum. Alkaline emulsifying agents used in water paint quickly attack aluminum. Consequently, for our purpose, the best quality paint by conventional standards is not always the best one for aluminum. It becomes apparent and of the ut-

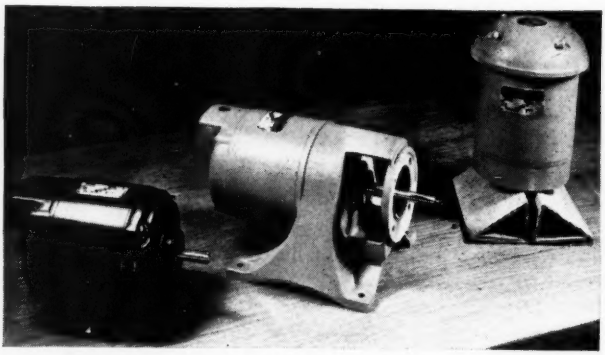

Fig. 1—Finishes for aluminum castings must cover the porous surface completely, must be serviceable under specified conditions, and must be attractive, as shown in this illustration.

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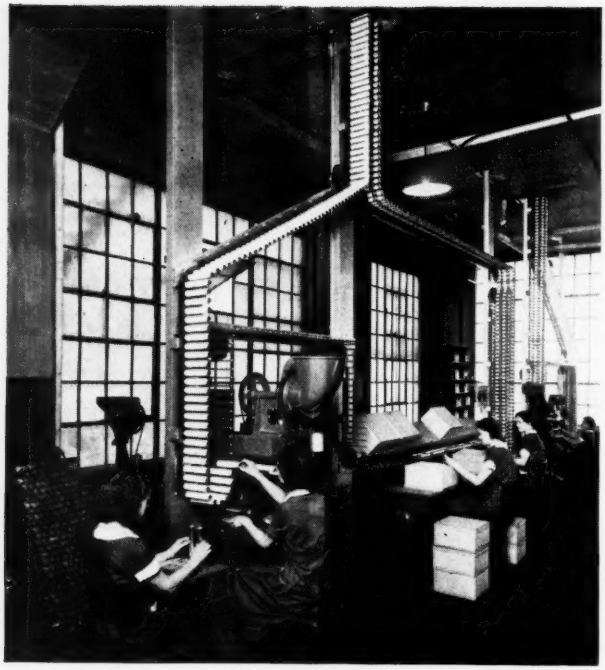

Fig. 2—The exterior coating of light gauge extrusions of wrought aluminum, such as the collapsible tubes shown in this illustration, must provide maximum gloss, depth, coverage, and flow and must be sufficiently flexible to prevent chipping or cracking. In addition, the painted surface must lift inks with maximum clarity by means of a dry printing process.

most importance, therefore, that finishes for aluminum be prescription compounded for that metal and its particular use. In no other way can the fabricator or finisher be assured of the success of his product.

For the purposes of this article we are going to group aluminum into two general classifications—cast aluminum and wrought aluminum. These two groups include castings, extrusions, forgings, sheet, and foil. No matter what casting method is used—die, permanent mold, or sand—the finish used must perform the same functions. It must cover the porous surface completely, it must be serviceable under specified conditions, and it must be attractive, as shown in Fig. 1.

To fulfill these requirements, it is necessary that the casting be pretreated. Any of the following methods will serve satisfactorily: sandblasting, phosphate treatment, solvent phosphoric acid treatment, chemical oxide coating, and electrochemical oxide coating. In order to remove all water or solvent vapor which might be trapped in the pores of the metal during pretreatment, the casting should be baked at 250 deg. F. before the finishing operation.

Surface imperfections in castings can be minimized or obliterated by the use of a finish which provides a hammered or wrinkle effect. In cases where extreme durability is required, a two or three-coat system should be employed. The first coat should be a suitable primer to ensure adhesion of the finish coats. A zinc chromate type is usually recommended for this purpose. The second and third coats should be specifically designed to meet predetermined needs.

Little difficulty should be experienced if the castings are finished in the manner just described. Most unsatisfactory results which finishers of aluminum have experienced have been due to their erroneous assumption that any metal coating will work with aluminum. Prescription compounded coat-

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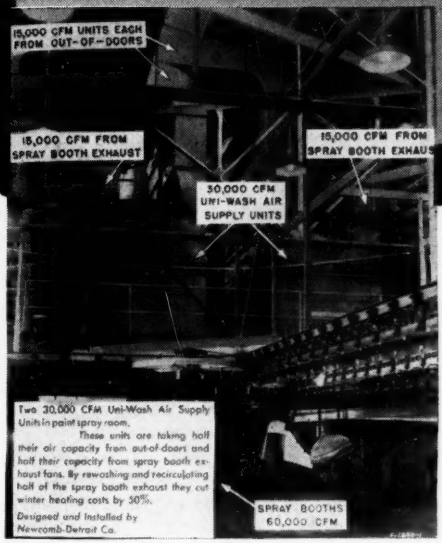
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ings provide the only real answer.

Light gauge extrusions of wrought aluminum, such as used in collapsible tubes, present some very specific finishing problems. The cleaning method is especially important, since a light film of lubricant remains on the metal

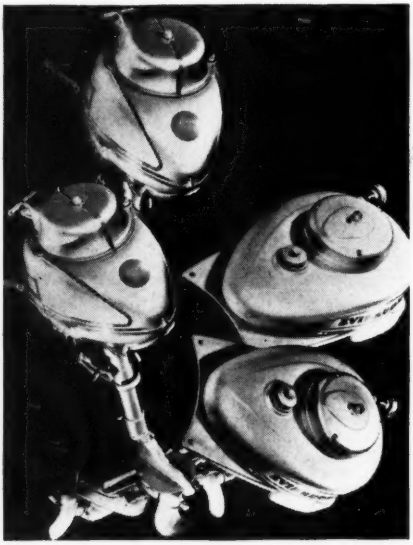

Fig. 3—The finish coats for heavy gauge extrusions of wrought aluminum, such as these outboard motors, must provide durability.

after the extruding operation. This film should be removed by an inhibited alkaline cleaner followed by a hot or cold water rinse or by solvent vapor degreasing before the finishing process is begun. The interiors of the tubes should then be flushed.

The interior finish of the collapsible tube must be non-toxic, tasteless, and odorless. Often, it must be chemically resistant, depending upon the contents of the tube. Phenolics provide coatings which most nearly fulfill all these requirements, and vinyls are also being used increasingly.

As shown in Fig. 2, the exterior coating of the tube has decoration as its primary function. It must provide maximum gloss, depth, coverage, and flow, and must be sufficiently flexible to prevent chipping or cracking as the contents of the tubes are expelled. In addition, the painted surface must lift inks with maximum clarity by means of a dry printing process. In cases where extreme resistance is desired, a clear finishing varnish should be employed. Frequently, it is necessary to obtain optimum results with minimum baking temperatures, and finishes should be selected carefully with this consideration in mind.

Heavy gauge extrusions and forgings require almost similar treatment as light gauge extrusions. The method of cleaning depends upon both the size and ultimate use of the object. Where smooth painted or polished surfaces are desired, cleaning by solvent degreasing is recommended. On parts for large structures and similar objects, cleaning with the use of inhibited alkali followed by acid and a water rinse is recommended.

The coating should be carefully selected. A clear vinyl solution will provide a marproof finish which will improve the brilliance of highly polished aluminum. A coating of this type, however, has to be formulated with correct resins and plasticizers in order to result in a tough, flexible, "water-white" film. Also essential is a balanced solvent combination which contains the correct percentage of slow solvent to allow the film to flow out smoothly, combined with faster solvents which cause the finish to set up quickly and prevent contamination by dust, etc.

The coating of aluminum structural or architectural forms presents the problem of repainting in addition to that of the original finish. The requirements are much the same in both cases. After cleaning, the prime coat is extremely important. Zinc chromate is generally used for this purpose with aluminum since it forms a corrosion-

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resistant bond between the metal and the finish. The successful use of zinc chromate, however, depends largely upon its being suspended in the proper vehicle. The entire value will be lost unless the bond completely prevents entrance of moisture and underfilm corrosion.

The finish coats must provide durability, as illustrated in Fig. 3. This property is best attained through the

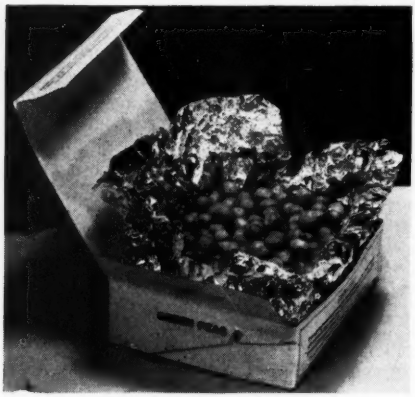


Fig. 4—Like all other forms of aluminum, aluminum foil must be coated with specifically compounded coatings for best results.

use of long oil finishes, either alkyd or oleo - resinous. Where forms can be coated prior to assembly, a baked realkyd finish has been found to provide excellent results.

The repainting process must be carried out with the same technique. Special care must be taken that the surface is entirely clean before the process is repeated.

Sheet aluminum is available in a wide variety of gauges. For finishing purposes, they can be arranged into four groups: heavy gauge structural sheet, medium to heavy gauge architectural sheet, medium to light gauge sheet, and aluminum foil. The finishing of heavy gauge structural sheet should be handled in the same manner as structural extrusions which were discussed above.

The coating of architectural sheet calls for two different processes, one for interior use and one for exterior use. For interior sheet, the usual cleaning agents are inhibited alkali followed by phosphoric or chromic acid treatment and a hot or cold water rinse. For exterior use, cleaning may be accomplished by chromadizing, phosphating, chemical or electrochemical oxide coating, or solvent phosphoric acid cleaning. In either case, a primer which will prevent any film corrosion formed by moisture and which leaves a surface adaptable to a wide variety of finishes should be used. Application of materials can be effected either by the spray or brush method.

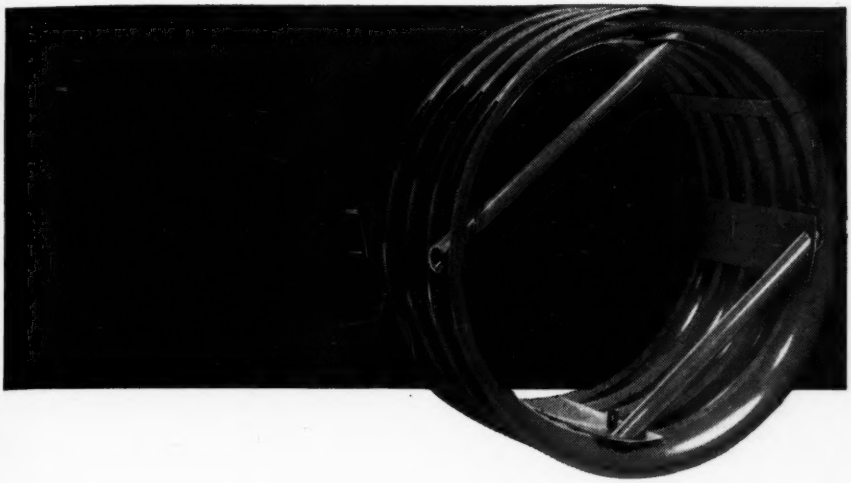
The primer coat is particularly important where prefabricated building sections are involved, since these sections cannot be readily cleaned for painting. Therefore, the primer coat must wet the very fine surface oxide present, adhere well over hand marks, possess a closely regulated surface tension to prevent crawling, be sufficiently flexible to withstand a cold bend test and constant minor vibrations, and possess sufficient "tooth" to hold the finish coats. Obviously, such a primer must be precisely formulated.

The finish coat for architectural sections must anchor firmly to the primer coat. Its chalking must be carefully controlled, and the finish must be weather resistant.

Light gauge sheet is usually only solvent cleaned or used as it arrives from the mill. A recommended method of coating it is by roller coating. This method offers evenness of film and the consequent maximum protection. A wide variety of finishes, encompassing almost all desired characteristics, are readily available for the roller coating operation.

A particular problem in the aluminum closure and container industry

Does This Look Like a Tough One To Lick?



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is the fact that the first coat applied to products may be required to withstand four or five baking operations without losing its initial flexibility for fabricating. A typical closure finishing process is as follows: first coat—an interior resistant gold lacquer, possibly vinyl; second coat—a vinyl size for exterior; third coat—a base white coating applied over the size; fourth coat—one to four lithograph prints, baked one or two at a time; fifth coat—a resistant finishing varnish over the inks.

In the above process, the first three coats are baked in a conveyor oven before application of the succeeding one. The inks are baked as outlined above, and the lithographer may apply his last print to the plate and varnish while the ink is still wet to eliminate one baking operation. This "wet print varnish" must be carefully formulated so that it does not cause bleeding of the inks yet retains the depth, clarity, and so on, of a finishing varnish.

Each of the above mentioned coatings is baked 10 to 20 minutes at temperatures up to 375 deg. F., yet the finished sheet must fabricate perfectly. High solids vinyls are strongly recommended for this type of application since they are non-oxidizing. They retain outstanding fabricating qualities on extended aging, and their high nonvolatile content provides for maximum hiding power combined with economy.

Aluminum foil is essentially a very thin sheet of aluminum. No prefinishing treatment is necessary since the foil is generally annealed at the point of manufacture. Supplied in roll or coil form, aluminum foil can be coated by the roller, reverse roll, gravure, or knife coating process. Like all other forms of aluminum, however, it must be coated with specifically compounded coatings for best results, as illustrated in Fig. 4.

(All photos courtesy Aluminum Company of America, Pittsburgh, Pa.)

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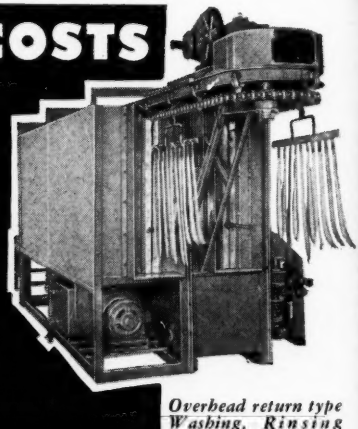

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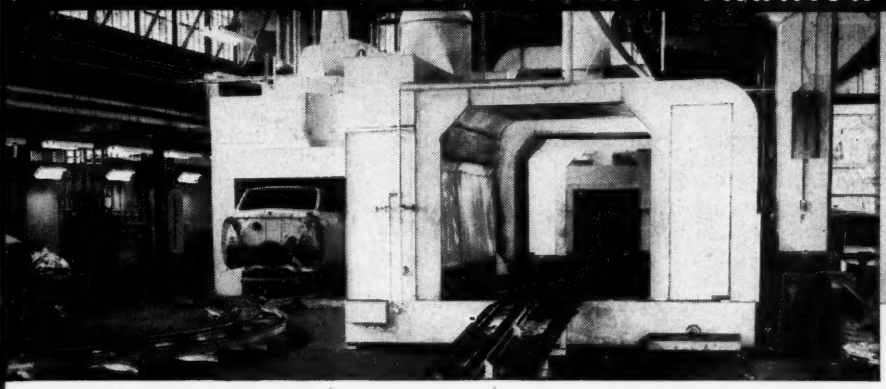

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MAHON

Finishing Clinic

Organic Coatings for Corrosion Protection

By DR. ALLEN G. GRAY

•

A Monthly Digest on Current Technical Progress Indicating Significant Trends and Developments in the Finishing Industry

•

THERE is no better time than now, at the early stages of this year, for those responsible for the selection of finishes to consider some of the primary factors which provide for long service life of organic coatings applied to metal products. According to a discussion on organic coatings for corrosion protection presented by George W. Seagren, Mellon Institute of Industrial Research, before the Third Annual Symposium on "Modern Metal Protection" in Cleveland, organic coatings are effective means of preventing the corrosion of metals primarily because they serve as protective barriers between the metal to be protected and the environment in which the corrosion will occur. The effectiveness of a coating system for this purpose is relative to four characteristics: (1) the coating must be continuous; (2) it must resist the spread of corrosion from uncoated areas; (3) it must have a high degree of impermeability; and (4) it must not itself be degraded by its environment.

There is no overlooking the important fact that a coating, to be an effective protection, must be **continuous.** In actual practice there is some element of difficulty in the proper application of a coating system to form a continuous film, and, if the coating film is produced free from discontinuities initially, there is always the possibility that the coating may be accidentally injured during its service life. This problem of producing and maintaining a continuous coating creates the necessity for selecting coatings which have suitable properties

THIS MONTH . . . Organic Coatings for Corrosion Protection . . . Sources of Impurities in Plating Solutions . . . Addition of Alumina to Porcelain Enamel Frits Improves High Temperature Corrosion Resistance . . . Electrographic Printing of Pores in Protective Coatings.

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and for exercising great care in applying them. No one coating system will serve equally well for all uses.

One of the best ways to keep to a minimum the number and size of discontinuities in a coating is to apply more than one coat. A single-coat system is seldom used except where the conditions of use are only mildly corrosive. In most cases, two to three coats are recommended and, for extremely corrosive conditions, five or more coats may be used. Discontinuities in any one of a series of coats will not usually coincide with those in preceding coats, and thus the number of accidental discontinuities which will remain in a finished coating will be decreased considerably with each succeeding coat. Modern spray coating technique will assist in the proper application of organic finishes.

Importance of Metal Surface Preparation. Finished coatings frequently are not continuous initially, and discontinuities can be formed by accident to a paint film during its service life. Thus, the presence of discontinuities, however caused, is the reason why the second requisite characteristic of a good coating, as discussed by Seagren before the "Modern Metal Protection" Symposium, is important; that is, **the ability to resist the spread of corrosion from areas exposed by discontinuities and the enlargement of the discontinuities themselves.** Coatings are not always weakened or destroyed directly by their environment. Frequently, they are degraded by products of corrosion reactions near or under them.

It should be kept in mind, in the selection of overall finishing processes, that the preparation of metal surfaces for organic coatings is one of the most important phases of the organic finishing cycle for metal products. Often, premature failures are blamed on the finishing materials, when the true cause is improper surface preparation or detrimental contamination of the surface prior to painting. Providing metals with a non-metallic coating of the proper texture adapted to inhibiting corrosion and increasing the adhesion to the final organic finish are the primary factors in the preparation of metal for organic finishing. The cleaning and preparation of metal for painting is so familiar to organic finishers that it is apt to receive but minor consideration, with regard to the paint coating itself, and the fact that it has a definite function in relation to the useful life of the paint finish is often overlooked by the manufacturer. Present-day demands for increased corrosion resistant finishes on metal products have resulted in more durable organic coatings and improved scientific methods for preparing metals to retain an acceptable finish.

Failure by Undercutting. Discontinuities in coating films, as was pointed out by Seagren, can permit the progress of still another reaction, which is not a degradation of the film itself,

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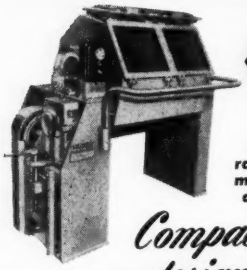

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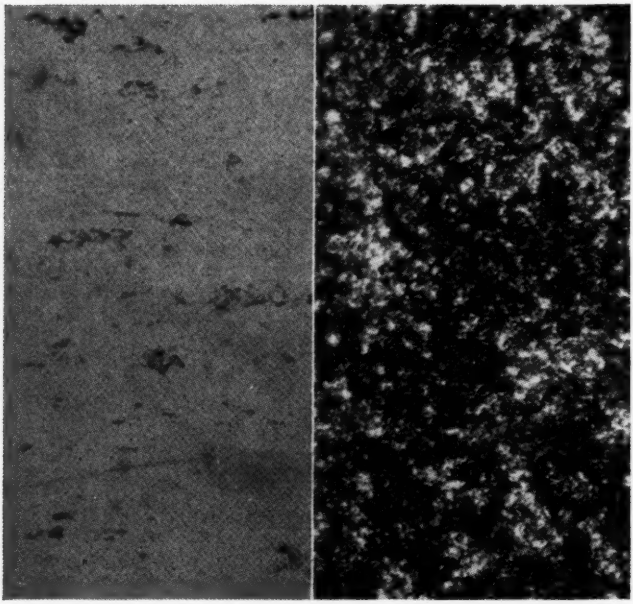

Fig. 1—(Left) Photomicrograph of piece of plain bright finished sheet steel. (Right) Photomicrograph of piece of sheet steel after treatment to produce a phosphate type conversion coating on the surface to serve as a base for paint. Magnification, 100X. *(Photos courtesy Parker Rust Proof Company)*

but nevertheless destroys the efficiency of the coating. This corrosion process is generally known as undercutting. Thus, undercutting is that process by which a coating is loosened from metal adjacent to exposed areas by corrosion of the metal under the coating. The corrosivity of a metal in the environment in which it is used is known to affect the protective life of applied paint coverings. Therefore, surface treatment has been stressed by many investigators in preparing metal products for organic coatings, and generally without exception the treatments recommended have as their main objective the formation of a stable and non-reactive coating, chemically combined with the base metal, which not only retards corrosion, but also provides for greater adhesion of supplied paint finishes.

Thus, pretreatment of metal products to prevent underfilm corrosion is common practice to improve the quality and service life of the coatings applied. In general, such processes consist of producing on the surface of the metal, by reaction with the metal itself, a suitable inert compound of the metal, such as, for instance, the oxide or phosphate. Such a coating is called a conversion coating and the type to be preferred, in the particular coating application, depends to some extent on the particular metal to be protected and the environmental conditions of service life exposure. For steel, the conversion coating is usually of the phosphate type, examples of which are shown in Fig. 1, although it has been reported that the oxide type coatings have been used for some applications. For aluminum, the oxide and phosphate type coatings are used, whereas for zinc, in addition to the phosphate type coatings, chromate type coatings may be employed. Satisfactory pretreatments have also been worked out to effectively prepare magnesium, copper alloys, and lead for organic coatings.

Theory of Underfilm Corrosion. Usually, as was pointed out by Seagren, underfilm corrosion reactions are gen-

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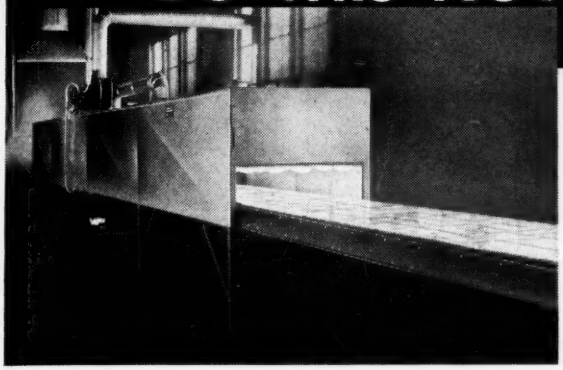

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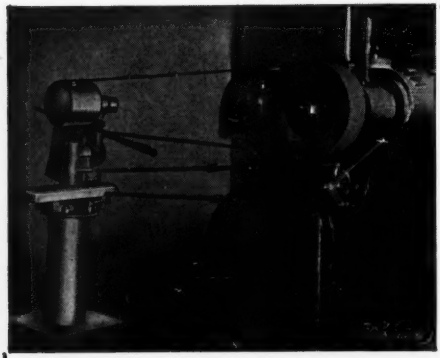
erally considered to be electrochemical in nature. The electrochemical theory of corrosion postulates that the steel surface is not entirely homogeneous, and will tend to develop electropositive and electronegative areas, which exhibit different tendencies. It has been well established that in the rusting of steel, as a result of these two tendencies, two reactions take place simultaneously upon its surface; ferrous ions pass into solution and hydroxyl ion or alkali is formed. Thus, when these reactions take place on a painted steel surface, the paint film loses its adhesion progressively over an ever expanding area.

Thus, it is generally accepted that such reactions are electrochemical in nature. In an aqueous environment, an area of bare metal which is exposed by an opening in the coating is anodic; the metal adjacent to such an area and beneath the surrounding coating is cathodic. As the electrochemical reactions proceed, the cathodic area becomes progressively alkaline, and the coating film in this area will progressively deteriorate. The greater the conductivity of the electrolyte between the two electrode areas, the greater will be the electrochemical reaction and the amount of alkali formed.

Adhesion of Coatings. Restricting corrosion to areas of bare metal by means of organic coatings, according to Seagren, is also a function of the **adhesion** of the coating itself to the surface of metal. Adhesion of a coating is basically of two kinds; namely, mechanical and chemical. Mechanical adhesion, which is mainly "keying" or locking, depends on the character of the metal surface, since smooth surfaces provide poorer mechanical adhesion than do rough surfaces. Chemical adhesion, thus, as emphasized by Seagren, is a function of the coating material. In the resin phase, a coating material consists of long chains, closed



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chains, cross-linked chains, or any combination of these types. These resin molecules vary in size and shape and have various molecular fields of force about them. Attraction is stronger between a metal surface and strongly polar groups of molecules, therefore, coatings which contain such molecular groups adhere more firmly to metal than do coatings in which groups are only weakly polar. It is generally accepted that the attraction of polar resin molecules to metal is more important in providing adhesion of coatings than mechanical "keying" or locking.

One thing the finishing engineer should keep in mind concerning the application of any coating is that it is necessary that the surface to be coated be clean, since a film of grease or dirt on the metal surface to be coated can seriously diminish the attraction between the molecules of the coating and the surface of the metal or metal compound.

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Permeability of Coatings. According to Seagren's presentation, the third important property of a coating for preventing corrosion of metal is **permeability.** Permeability is usually thought of by the protective coatings technologist as the rate at which a gas or liquid will diffuse through the organic film to the surface of the metal beneath. The rate of permeation through coatings may vary over a wide range, and while it may be relatively easy to select a protective coating material with the least permeability, such materials may often be very poor in other important properties, such as, for example, flexibility, chemical resistance, ease of application, and so on. Thus, oftentimes it may be necessary to reject the most impermeable coatings for others which meet certain necessary requirements.

While it is generally agreed by most corrosion engineers that complete exclusion of moisture through coatings cannot be obtained, there are ways of minimizing the effect of moisture. First, as was pointed out by Seagren, permeability can be reduced by special pigments. Pigments, such as aluminum, which have a flaky structure reduce permeability by lengthening the path which moisture must travel through the film from the outside surface to the underlying metal. Second, special pigments, by their oxidizing action, render the permeating substance less corrosive. Red lead and zinc yellow are familiar examples of oxidizing pigments. It has been suggested that both zinc oxide and basic lead chromate are effective probably because of their alkalinity.

Metal pretreatment can be listed as a third method, which reduces the corrosivity of the metal surface by producing on the surface of the metal a compound of the metal, which is less reactive than the metal itself. A fourth method relates that certain pigments may retard corrosion by being anodic

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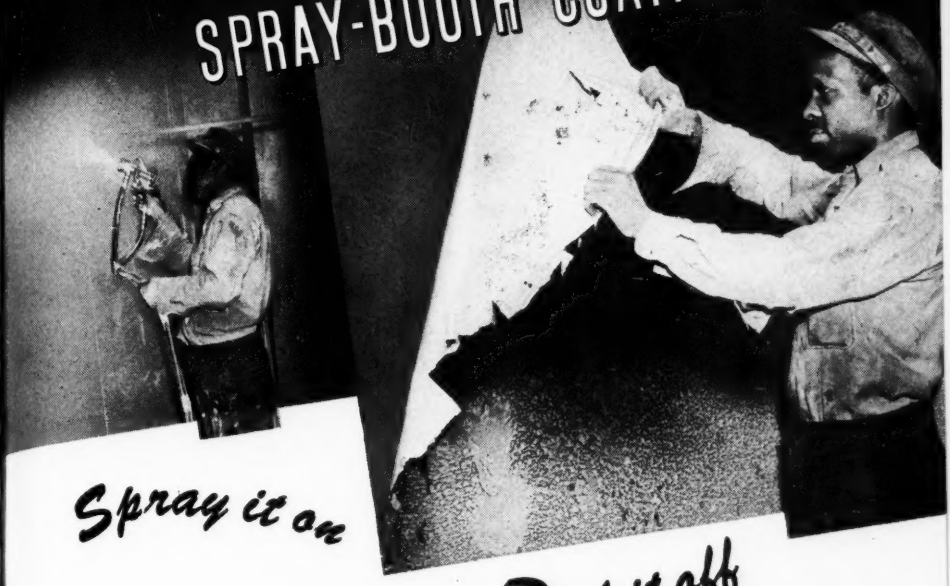

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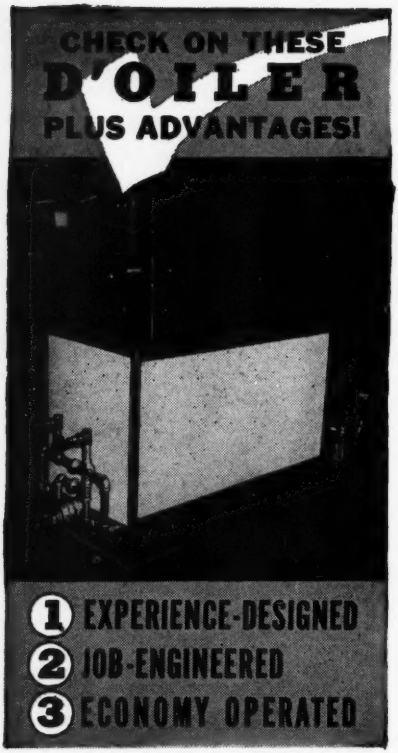

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with respect to the metal protected. Tests have indicated that high loadings of zinc dust or aluminum powder in organic vehicles produce what is, in effect, cathodic protection of underlying steel surfaces.

Degradation of Coating by Its Environment. For effective prevention of corrosion, an organic coating must have a fourth property; that is, it must resist degradation by its environment. This fourth property, as emphasized by Seagren, is contributed chiefly by the constituent film-forming or resinous substance which must be selected from a very large and rapidly expanding group of materials. Actually, the selection and adaptation of suitable resins to specific needs is such an important task that it should be assigned to individuals whose experience in the field of resin chemistry has been wide enough to sufficiently qualify them as experts.

Thus, it is important that the finishing technologist concerned with quality coatings keep abreast of scientific developments in his field and realize that within the past few years an increasing appreciation has developed of the underlying mechanisms by means of which the failure of organic coatings may occur.

* * *

Sources of Impurities in Plating Solutions

WHILE the presence of impurities in plating baths was at one time more or less ignored or tolerated by the electroplater, electrodeposits meeting today's requirements keep the problems of purity of solutions among the foremost facing the plating industry. In a comprehensive discussion of sources of impurities in electroplating solutions in the November 1947 issue of "The Monthly Review" of the American Electroplaters' Society, Myron B. Diggin, Hanson-Van Winkle-Munning Company, gives some advice which

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may be useful in helping to avoid plating solution difficulties by stating that a plating solution should never be allowed to come in contact with a material which has not been tested and found satisfactory. Sometimes a few simple precautionary measures in the plating room may prevent a great deal of trouble.

With the widespread use of high speed bright plating processes, numerous cases of contamination have been caused by metals used in accessory equipment such as thermometers, pumps, heat exchangers, filters, piping, and fittings. Broken thermometer bulbs containing mercury sheaths, or bimeta. ic thermometers in circuit, bronze pumps or fittings in nickel plating equipment, it was pointed out in Diggin's article, have caused many solutions to become inoperative. Sometimes certain types of packing in pumps and heat exchangers can cause trouble. There have been cases where solutions have been contaminated by organic impurities extracted from tank linings, connecting hose, filtration equipment, and rack coatings. However, today, as a result of extensive testing, progressive manufacturers of plating equipment and accessories know, and can recommend, the correct combination of materials to be installed for a specific application.

Solvents from protective paints, when not used according to the manufacturer's recommended procedure, have caused contamination of plating solutions; likewise, paint sprays and buffing dusts produced in the vicinity of plating tanks have in some instances caused contamination. Metallic dusts produced in the vicinity of the plating operations have often caused contamination of plating solutions.

It was brought out in Diggin's report that the critical eye of the electroplater is being turned toward water as a source of plating troubles. In room temperature solutions, various troubles have been definitely traced to both the water used in preparing and maintaining plating baths and that carried into the baths by drag-in from preceding rinses. Unfavorable characteristics, which might remain unnoticed in low current density baths, are more evident in high current density solutions in which bright or heavy deposits are applied. Evaporation losses are high in elevated temperature baths. Thus, when water is added to compensate for these losses, the constituents originally present in the water become concentrated, with the result that a soft water does, in effect, become hard water and hard water becomes abnormally hard in the plating tank. Soluble mineral constituents listed by Diggin as being brought into the solution with water are iron, aluminum, calcium, magnesium, sodium, potassium, silicon, carbonate, sulfate, chloride, and possibly phosphates.

Other sources of plating solution

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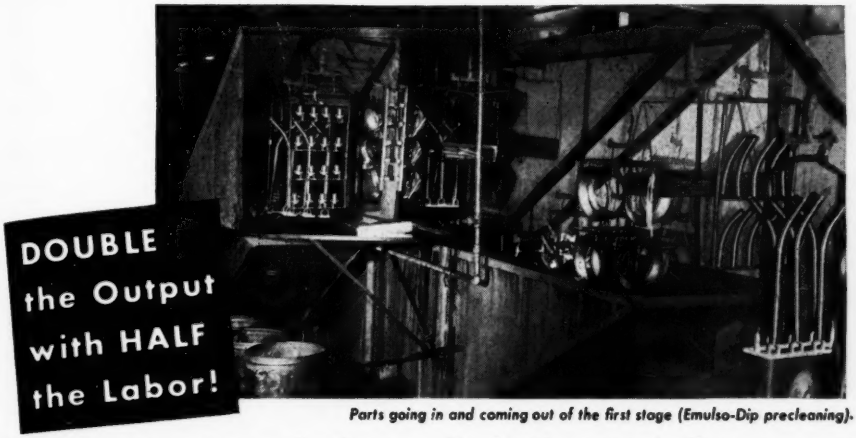

Parts going in and coming out of the first stage (Emulso-Dip precleaning).

The 412 component parts of a famous vacuum cleaner used to be cleaned by hand before finishing. Eight men were needed to wash, rinse and wipe the parts.

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Dirty parts are hooked on an overhead conveyor and fed to the first stage, where they are pre-cleaned in Magnusol (Emulso-Dip process). They move on, draining on the way to the third stage where a cold water spray at 40-lbs. pressure knocks off loosened dirt. The fourth stage involves a mild Magnus alkaline cleaner spray washing, followed at the fifth stage by a hot water spray rinse. Stage six provides a cold air blast to remove clinging water particles to prevent spotting, and stage seven is a final drying operation at 200°F. Parts are then ready for painting or plating.

Write Magnus about specially designed machines for gearing your cleaning operations into your production line.

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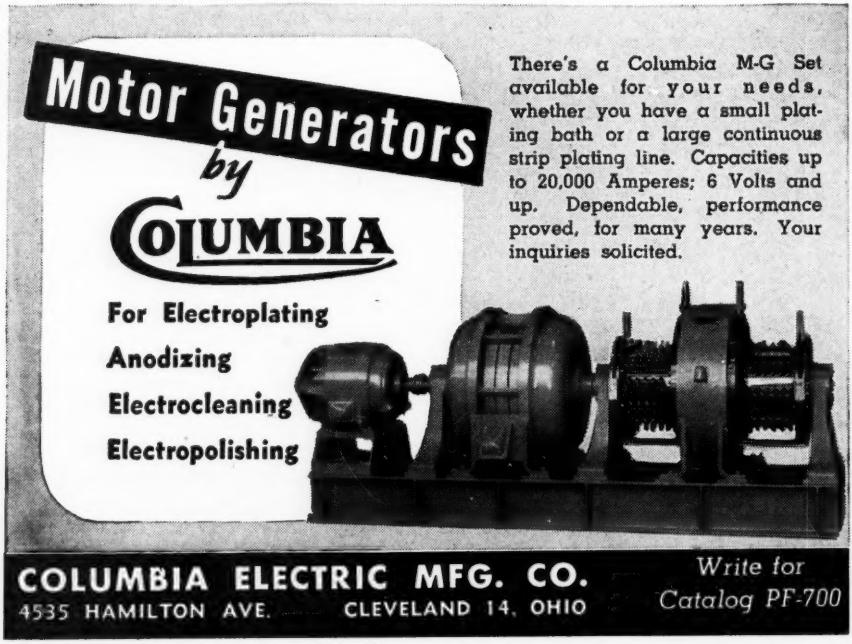
contamination pointed out and discussed by Diggin were (1) plating solution dripping on tank rods; (2) work falling from racks and allowed to remain on the bottom of the tank; and (3) the dissolution of metals while they are being plated, due to poor contacts in racking or bipolarity attributed to the design of the article. Thus, the plater interested in the consistent production of high quality deposits should keep in mind these sources of solution contamination brought out by Diggin, and in so doing remember that a few precautionary measures may eliminate considerable trouble in the production line.

* * *

Addition of Alumina to Porcelain Enamel Frits Improves High Temperature Corrosion Resistance

DATA were presented by W. N. Harrison, National Bureau of Standards, before the Third Annual Symposium on "Modern Metal Protection" in Cleveland, which showed that the addition of alumina to conventional porcelain enamel frits improves the performance of the coatings in high temperature service. The alumina type of ceramic coating was developed during the war at the National Bureau of Standards for the protection of mild steel in high temperature service, and was used by the Army and Navy on the exhaust systems of certain aircraft and other vehicles.

The outstanding features of the coatings, as reported by Harrison, are (1) high resistance to chipping under repeated severe thermal shock, (2) protection of the metal against oxidation during prolonged exposure in air at temperatures up to about 1,250 deg. F., (3) freedom from cracking and blistering under conditions of high temperatures and severe thermal gradients, and (4) a mat surface that does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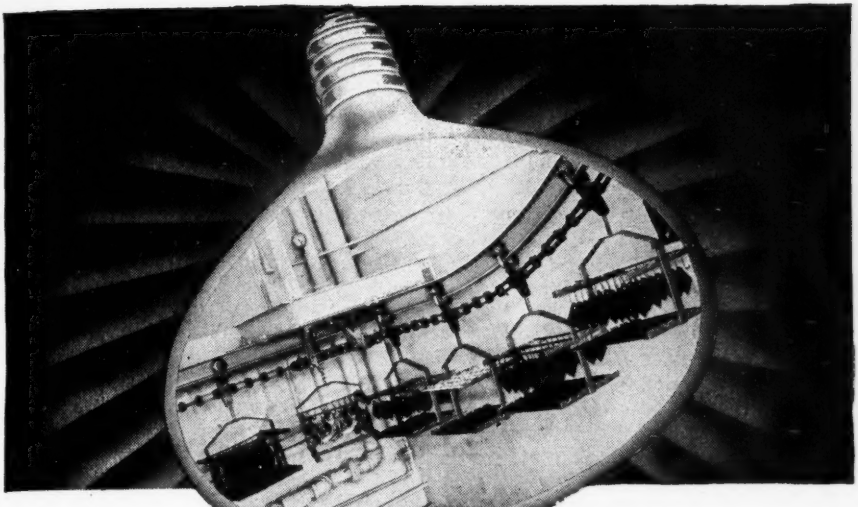

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Typical of G-W systems speeding production and cutting costs is this modern, conveyorized, infra-red baking installation at the Yale and Towne Mfg. Co., Stamford (Conn.) plant. Better finishes—faster and cheaper—on Springlatch cases result: *Four-hour finish cycle cut to 90 minutes!*

Other manufacturers "going G-W"—(putting in infra-red systems custom-designed, built and installed by G-W)—know G-W means high speed work, uniform finishes through evenly distributed heat, and greater savings from perfectly geared over-all plant operations.

Since the first introduction of infra-red techniques G-W has kept abreast of all advances. Add to this over 130 years of material handling experience. This combination of skills gives G-W unusual ability in designing complete infra-red systems—taking full responsibility for conveyors, lamps and allied equipment.

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Table I

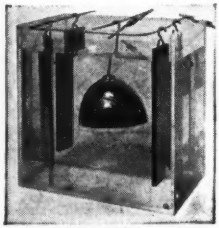
Mill Batches Used in the Preparation of NBS Ceramic Coatings A-19, A-20, and A-55m

Frit I	50.0	—	—
Frit II	50.0	100.0	100.0
Calcined alumina	25.0	20.0	15.0
Enameler's clay	10.0	6.0	15.0
Black cobalt oxide	1.0	0.25	0.50
Citric acid crystals	0.05	0.05	0.03
Water	50.0	50.0	50.0

not show highlights and, therefore, decreases the visibility.

To prepare these coatings, a mixture of a special grade of calcined aluminum oxide and a conventional type of ground-coat frit is ground with water to appropriate fineness, and is then applied to the metal, dried, and fired according to well-known methods used in the trade. Early in the study of the alumina admixtures at the Bureau of Standards, it was discovered that the type of alumina grain had a controlling influence on the characteristics of the coating. For example, it was found that fused alumina, or alumina calcined at high temperatures, produced dense, glossy coatings when so fired as to provide satisfactory adherence. These glossy coatings all showed reboil when heated to appropriate temperatures. Other grades of alumina calcined at lower temperatures produced mat coatings that were free of reboil when substituted, in the same formula, in like amount. A-1 alumina obtained from the Aluminum Ore Company, East St. Louis, Illinois, was of this type and was used as the refractory admixtures in the coatings selected. Three of these coatings prepared with admixtures of A-1 alumina, listed in Table I, were found to be outstanding from the standpoint of appearance, ease of application, and adherence to the metal.

In addition to the use of these new ceramic coatings for the protection of low-carbon steel in various military exhaust systems, it was pointed out by Harrison that there are a number of other possible applications where the new coatings, or modifications thereof, might be beneficial in prolonging the life of steel parts which are subjected to relatively severe temperature conditions. Such potential applications would include the coating of domestic stove parts, such as grates or burners, and industrial furnace parts, such as muffles, dampers, or burners, as well as parts for heat exchangers. Another use that was pointed out by Harrison is as a coating for the inner cylinders of the burner jackets used on kerosene stoves. Other potential uses are for annealing boxes and as a coating for mufflers and tail pipes.



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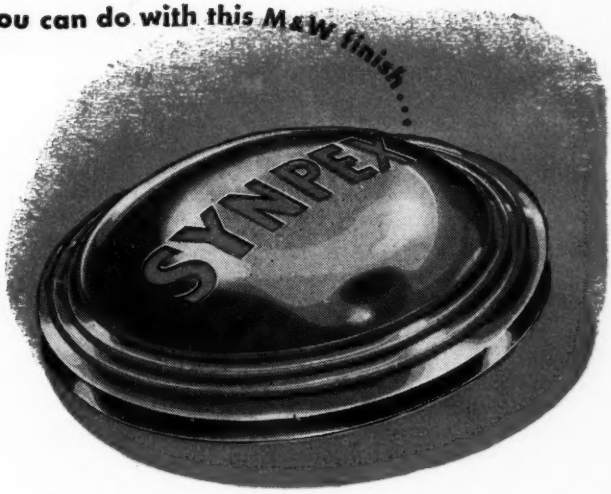

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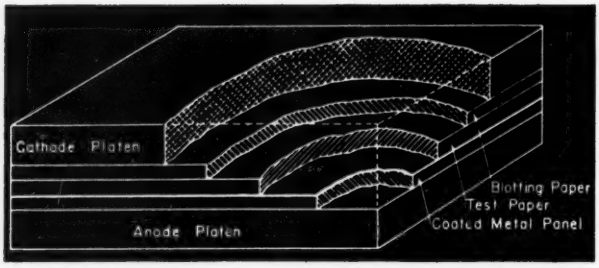

Fig. 3—Drawing of test assembly used in electrographic printing of pores in organic coatings (*Drawing courtesy "Analytical Chemistry"*)

Electrographic Printing of Pores in Protective Coatings

IT is generally recognized in the metal-finishing industry that many tests of protective coatings depend for their ultimate results, to a great extent, on the porosity of the coating. Thus, a need for a precise method of evaluating the porosity of a protective coating film is highly desirable. There has been considerable interest in the use of the electrographic technique for the porosity evaluation of protective coatings, such as those represented by paint films. Described in the October 1947 issue of "Analytical Chemistry," published by the American Chemical Society, in a paper by W. E. Shaw and E. T. Moore, National Lead Company Research Laboratories, is a method for the determination of porosity in protective coatings by the use of a simplified electrographic instrumental procedure that permits the recording of porosity data of quantitative significance.

Essentially, the method involves anodic solution of the metal underlying the protective film, transmission of the cation through the pores of the film, and retention of the metal ions on a paper in contact with the film and the cathode. Subsequent development of the paper in the proper reagents results in the formation of a colored metal salt, permitting the determination of location and approximate size of the pores and cracks through which the metal ions have passed. For the work reported by Shaw and Moore, the base metal was iron; however, with the proper choice of developer any other structural metal may be used. The equipment used in the tests consisted of a 20-ton Elmes press, a suitable current source equipped with suitable measuring devices, and two sets of pressure platens. Figure 2 shows the electrical setup. Shown in Figure 3 is a detailed, sectional view of the platens used to hold the test specimen.

The procedure for carrying out the

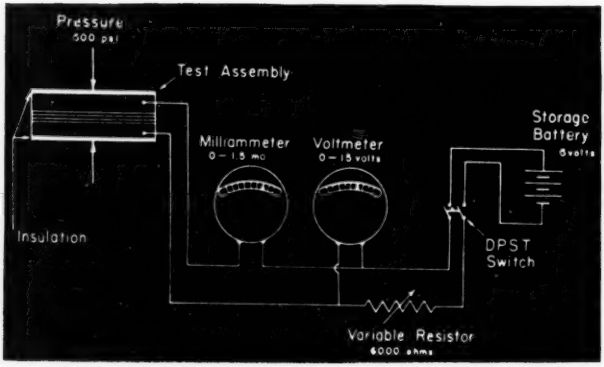

Fig. 2—Drawing showing complete assembly of test equipment for electrographic printing of pores in organic coatings (*Drawing courtesy "Analytical Chemistry"*)

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test on a coated metal panel is as follows: Blotting paper and imbibition paper are cut to the size desired for the final print; these pieces must be exactly the same size. The kind of paper used for the printing is important. Coarse or rough grained paper was found to provide unsuitable clarity. Paper containing large quantities of sizing or coloring agents can cause unevenness in printing. As a result of a series of tests, Kodak's imbibition paper, double weight F, was found to be the most satisfactory paper for this use. The papers, when cut, are soaked in a 5 per cent solution of potassium nitrate for 30 minutes. Both blotting and print papers are removed from the soaking bath and, together, squeezed between two dry pieces of blotting paper, which must overlap the soaked papers by 0.75 inch on all sides. The pressure used should be approximately 550 pounds per square inch. The wider border of the dry papers will take up the excess solution squeezed out of the soaked papers.

The coated test panel is then laid on the anode platen with the metal of the panel in contact with the metal of the anode, and the imbibition paper placed emulsion side in contact with the area of which the desired porosity study is to be made. The soaked and squeezed blotting paper is laid congruently on the imbibition paper. The cathode platen is then placed over the blotting paper. This entire "sandwich" is centered in the press and the necessary pressure applied. The current is switched on as soon as the pressure required is obtained. After a period of 20 seconds, the current is switched off and the pressure is immediately released.

The imbibition paper is placed in a developing bath made up of 25 g./l. of potassium ferrocyanide and 25 g./l. of potassium ferricyanide. Distilled water is used in the preparation of the developing solution, and generally 100 ml. will be found to be a sufficient quantity for developing the test paper. The prints are left in this bath for 30 minutes, washed in warm water until the yellow color of the ferricyanide is removed, and then dried between blotting papers or on ferrotype tins. The length of time which the film and paper must be maintained under pressure with applied potential was found, during the course of the investigation, to be an important factor. If too much time is allowed for the migration of the ions into the imbibition paper under a definite voltage gradient, these ions may migrate laterally on the test sheet and exaggerate the indicated size of the pore. Furthermore, the sharpness, as related to the true pore size, can suffer because of this migration. Finishing engineers having problems dealing with the porosity of organic coatings will be interested in further investigating this simplified electrographic technique.

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Barrel Finishing Consultant
Lansdale, Pennsylvania

CONTINUING the discussion of the various materials used in revolving barrels, and still within the period prior to 1901, it is necessary to invade an entirely different field than that of metal finishing for the foundation of the discussion. We are reasonably sure that no steel burnishing materials especially manufactured as such were used in American industry prior to 1903. If they were, it could have only been in what we would term sporadic instances, since steel balls were the first metallic materials used as burnishing medium and we have no reference to their use in barrels prior to the importation of the first eight Edmunds barrels and their accompanying load of steel balls in 1901. Barton could not have adopted them until at least 1903 for this is the year of the introduction of his tubbing machine, followed by Baird in 1908 and Abbott in 1910. Following this we had the Parsons Claims in 1912 and finally the Uebersax conception of barrel finishing first introduced in 1913. Consequently, prior to 1901 if any metal parts were finished in barrels it must have been either in the case where they were what we would now term "self burnishing" parts or, in lieu of that, they must have been operated with some one or another form of mineral substances in some usable form.

It has been just a bit difficult for us, in view of all the searches we have conducted, to reconcile ourself to such claims as, to quote, "barrel finishing or as it is sometimes stated, ball burnishing, has been carried on in this country for upwards of one hundred years." If this is true, then we would very much like to be informed by whom and where. There is nothing in the past record to give credence to any such claims.

The production of pigments for paints and the grinding of cement clinker in what are now termed ball mills or tube mills certainly antedated all of our recorded history of barrel operations, and here we make contact again with a product coming within the general classification of "pebbles." The word pebbles almost immediately identifies the product as a rounded off fragment of rock of some one of the mineral forms and so widely found in

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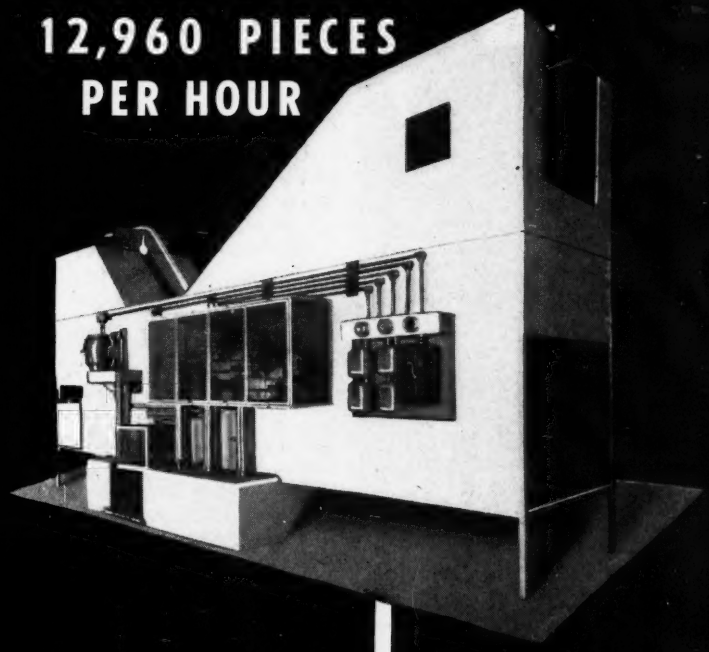

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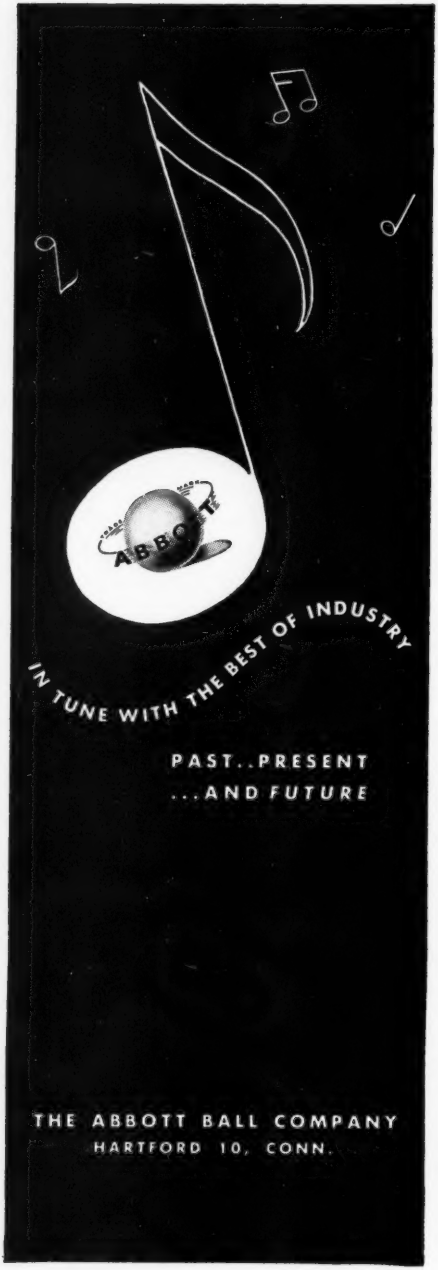

all parts of this country and of a range as wide literally as the range of minerals itself.

It would be quite reasonable to believe that the first applications of pebbles for grinding pigments were made by Edmunds about 1885 in England, but in this country there must have been countless persons acting as operators of grinding and pulverizing ball and tube mills who at one time or another must have given some thought to the operation of metal parts in much the same manner as pigments were ground, but we have no record of any such instances.

It must be that down through the years many sorts of pebbles of various sizes and materials were used and then discarded, in what seems to be a never ending search for the most adequate materials of this kind for barrel finishing use. For the present discussion we are concerned principally with just two pebble types, those known as Danish Pebbles and another variety known as French Pebbles, since for the most part those who have asked for information regarding pebble finishing have confined themselves to these two types, and perhaps it would be of more than passing interest to examine the analyses of these various pebbles.

Danish Pebbles, as their name implies, are gathered from and are a product of the coast of Denmark. They are quite smooth in texture, rather dark in color, and will withstand long hours of operation without fracturing since their grain structure is very close and fine. In the erosion of the Danish cliffs along the seacoast, small mineral particles are carried into the sea, and through the ebb and flow of the tide are carried back and forth until all of their sharp edges are worn away and they are left in substantially what we recognize as pebble form. The particles range in size from the smallest fraction of an inch to the larger imported sizes of 6 to 7 inches in diam-

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Fig. 1—(Left) Danish Pebbles (Right) French Pebbles

eter. A typical analysis of Danish Pebbles would show somewhat as follows:

Ignition Loss	1.13
Silica	97.94
Alumina	0.90
Ferric Oxide	0.02
Lime	Tr.
Magnesium	Absent

For comparison with the above analysis we present for you the analysis of two varieties of French Pebbles taken from different parts of the French channel coast:

1.

Ignition Loss	7.1
Silica	98.92
Alumina	0.36
Ferric Oxide	Tr.
Lime	Tr.
Magnesium	None

and

2.

Ignition Loss	7.0
Silica	98.20
Alumina	0.30
Chalk	0.40
Magnesium	0.10

In the second analysis we were interested in the inclusion of chalk in the analysis and we inquired about this. It seems that to the most of us we are given to thinking that the only chalk deposits as such that are in existence would be the White Chalk Cliffs of Dover which, of course, would be English, but we are also now informed that there are chalk cliffs in France as well, and that much of the French Pebble supply is found at the base of these cliffs. In the case of the Danish Pebbles, the chalk is eroded away and these solid mineral particles in a wide range of sizes are precipitated into the sea from which they are dredged, sized, and sent into the markets of the world, but principally for use as "grinding" elements in the operation of pebble mills.

We do not know whether photographs will be sufficiently clear to show the variation in color between the Danish and French Pebbles, but we are illustrating in Fig. 1 a group of each type in order that you may have a better conception of the actual appearance of these mediums.

In considering the application of any material, whether mineral or metal, in its relation to barrel finishing procedure, we always come back to one of the most important considerations; that is, the specific gravity of the ma-

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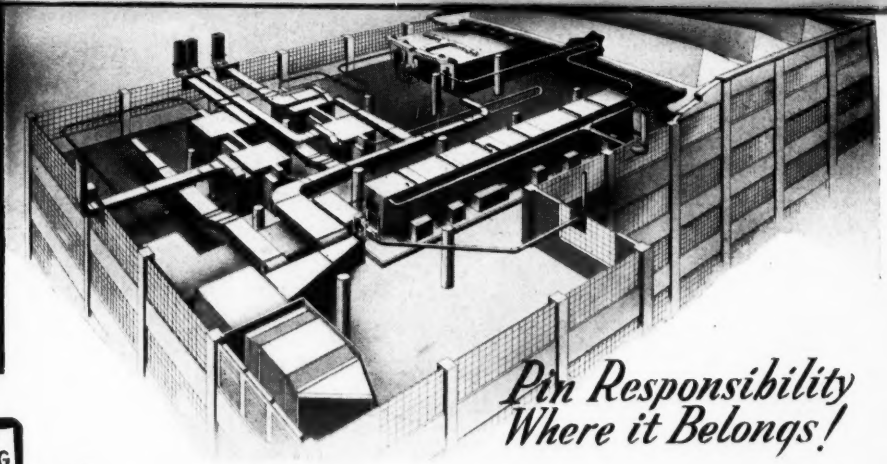

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terial so intended to be used as it would relate to the specific gravity of the metal parts on which it would be operated. We have so often told you that the mesne specific gravity of steel burnishing materials might be represented as 4.90. As distinguished from this, the specific gravity of both Danish and French Pebbles is about the same and would be represented by the figure 2.57. Thus, you will immediately see that with regard to the specific gravity, the steel materials are practically twice as heavy as are either of these pebble types. As to their weight relation, either Danish or French Pebbles will average from 100 to 103 pounds per bushel, whereas steel burnishing or cutting down materials will average a full 400 pounds per bushel.

As to the service life of these two pebble types, we recently talked with a prominent importer of pebbles and received his assurance that the French Pebbles are much superior with regard to their hardness and useful life and, that being lighter in color, have less tendency to darken pigments ground in barrels than the Danish types. While this would be an important factor in the reduction of paint pigments, it would have little or no bearing on the barrel finishing of metal products, however, hardness is very definitely a factor in the application of pebbles to barrel procedures in metal finishing.

To those of you who have followed these discussions, you will recall that a few months ago we discussed the finishing of aluminum parts in barrels, and we insisted that steel burnishing materials with their specific gravity of 4.90 were not satisfactory when operated on aluminum which, in casting form, would have a specific gravity of 2.583 or when rolled into strip and

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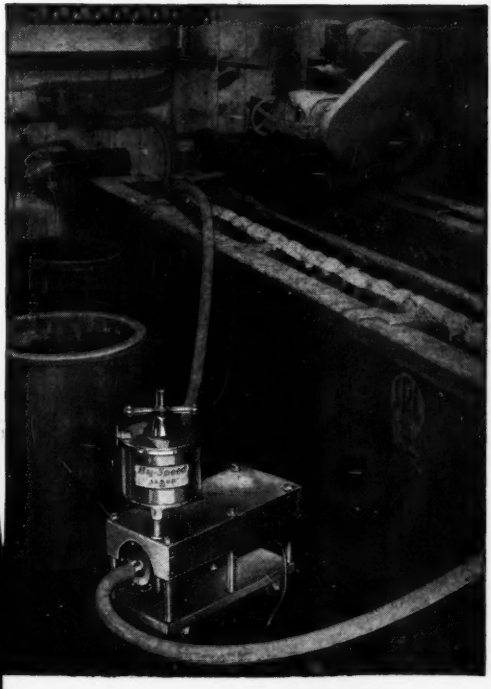

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blanked, a specific gravity of 2.67. To those of you who have requested information regarding the smoothing of aluminum castings, does the specific gravity rating of the pebbles we have been discussing and which is 2.57 mean anything to you as a medium for use in your barrel finishing work? It should, because here we have a very closely comparable specific gravity that should ensure retention of parts within the finishing mass.

What sizes would we recommend in case pebbles were considered properly applicable to the parts purposed to be finished? Well, certainly not the larger sizes, for the same evaluations as given to the range of various ball sizes in steel balls that you read several months ago apply equally and as pertinently in the case of pebbles. For our own part, we would start with the small range and by that we mean pebbles sifted out in the range of sizes that would run from ¼ to ⅜ inch inclusive, and then preferably in the proportion of three parts of pebbles to one part of work to be finished gaged by bulk and not by weight.

Whether you elect to use Danish or French Pebbles, you will find them both to have very smooth surfaces and in this condition and used alone they would not be a very considerable factor in the removal of any part of surface area, nor would they replace polished steel burnishing materials for the production of bright lustrous surfaces. They can only be considered as a weight adding and abrasive carrier medium and would constitute what we have always designated as the finishing mass.

As to what abrasive materials to use in conjunction with the pebbles, the field is wide and varied and literally runs the entire gamut from builders sand to the finer grades or manufactured abrasives. However, for cutting down or rapid surface area removal, we would select an abrasive material that would have the property of not only rapid cutting but that would also have the properties of fracturing and refracturing so that a continuity of new cutting edges was continually presented. This fracturing factor will be obtained as the abrasive is crushed between the pebbles forming the mass.

Should plain water be used as the liquid medium for carrying the abrasive? We should say definitely no, that something heavier is required and preferably of sufficient viscosity to hold the abrasives not so much in solution as to hold them in close adherence against not only the surfaces of the parts in process but also the surfaces of the pebbles constituting the mass so that the abrasive action will always be present. Quite naturally as the pebbles are operated in this manner with abrasives, they will be reduced in size, so that when we start with a size range of ¼ to ⅜ inch, in a comparatively short time these pebbles will re-

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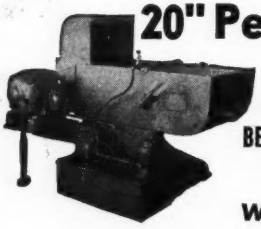

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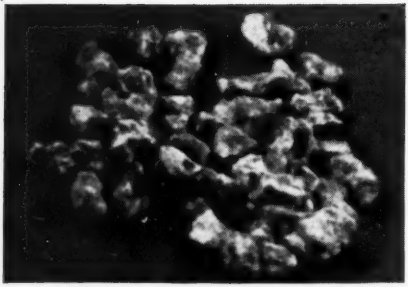

Fig. 2—Mica Schist

duce to a ratio of $\frac{1}{16}$ to $\frac{1}{4}$ inch. As the pebble mass shrinks, it is only necessary to keep replenishing the mass to proper load with your reserve stock of the pebbles in the $\frac{1}{4}$ to $\frac{3}{8}$ inch size range. In this way and within a comparatively short time you will find that you have a size range in your barrel that will run from $\frac{1}{16}$ inch or smaller to $\frac{3}{8}$ inch and that will present the maximum of points of contact to each inch of surface to be operated upon.

Since we do not recommend water, neither do we recommend oil as the abrasive carrier medium. You will find you have excellent results with regard to viscosity by the use of only slightly diluted corn syrup or glucose which is almost immediately soluble in water on completion of the operation and leaves no oily film that would present difficulties in removal subsequent to the barreling operation and prior to either plating or the application of some other form of finish coating.

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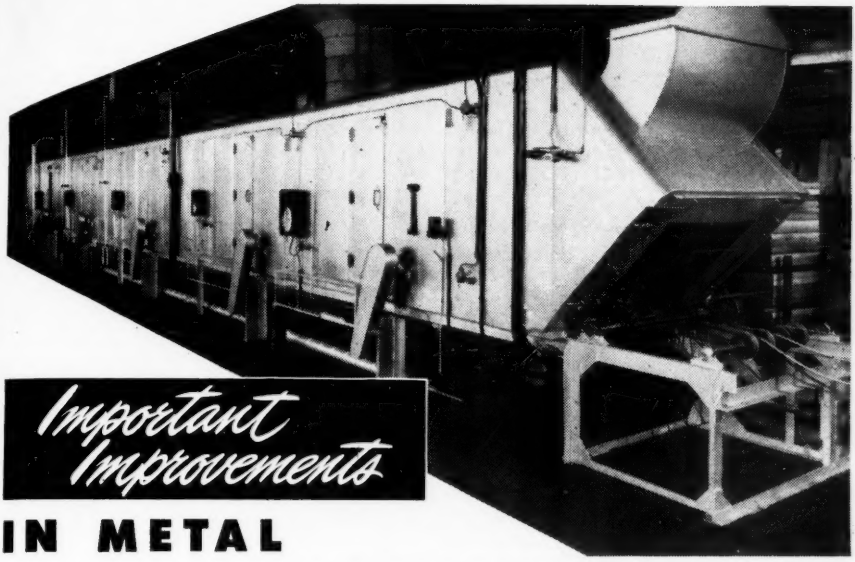

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you if your production is such that parts are required to be held over for periods between operations. In addi-

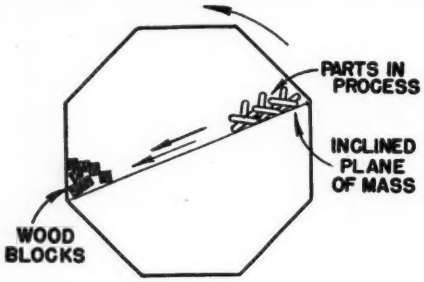

Fig. 3—Diagram showing inclined plane of burnishing mass of 33 x 19-inch barrel operated at 12-15 r.p.m.

tion, where iron and steel parts might have a tendency to form rust films, this same material will act as an inhibitor of corrosion. When used in solutions as mild as 0.1 per cent no indications of rust will be present even after several days. The material is very readily soluble in water and acts as a dispersing agent in that it will hold in suspension any finely divided particles of abrasive left on the parts after the barreling operation.

In a previous discussion (September 1938) we mentioned the experiments we had conducted with mica schist, which is a mineral form often designated as granite. This material, we explained, had many lines of cleavage to permit of its being fractured and refractured when used under pressure as an abrasive medium in barreling operations. We thought you might be also interested in an illustration of this material and so we are reproducing in Fig. 2 a small quantity to give you a general idea of its appearance. The particles illustrated have been ⅜-inch mesh graded, but in operation they quite rapidly are reduced in size, each fracture presenting new cutting edges until the material is exhausted.

This discussion would be hardly complete unless some mention was made of the addition of small wood blocks to the burnishing mass. Just why is this done and what is the major purpose? Figure 3 provides a diagram of a barrel showing the inclined plane of the burnishing mass as it would be at 12-15 r.p.m. for a 33 x 19-inch barrel. Parts coming to the top of the mass as shown will slide rapidly down the inclined plane of the mass and unless prevented will make impact contact with the iron barrel shell, thus resulting in the blunting of edges or nicking. For this reason wood blocks, which always float on top of the mass, are introduced into the barrel and will be found at the bottom of the inclined plane of the mass where they act as buffers and prevent actual contact of the parts with the sides of the barrel.

Figure 4 shows several typical wood blocks for use as buffers. These blocks can be made for you by any local planing mill or woodworking shop, preferably of maple or yellow pine. The blocks illustrated are 1 inch square and are used in the proportion of about one peck in bulk added to the

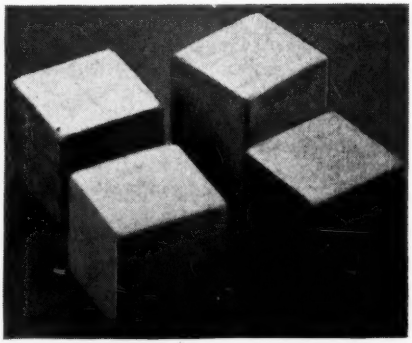

Fig. 4—Typical wood blocks for use as buffers in barrel finishing

nominal barrel load of finishing mass and parts as would be operated in a 33 x 19-inch barrel.

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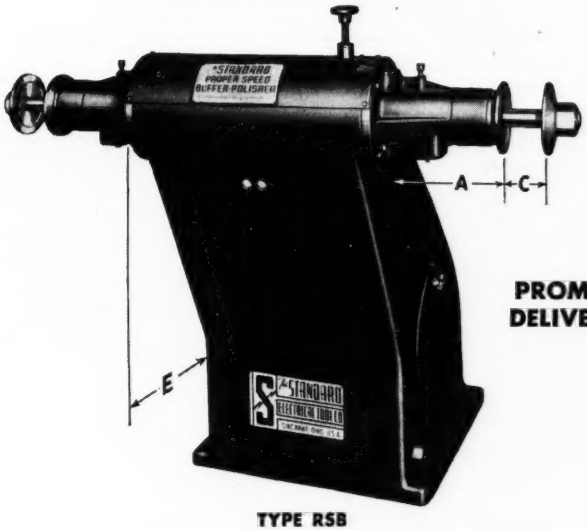

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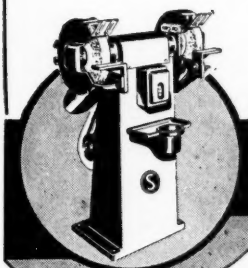

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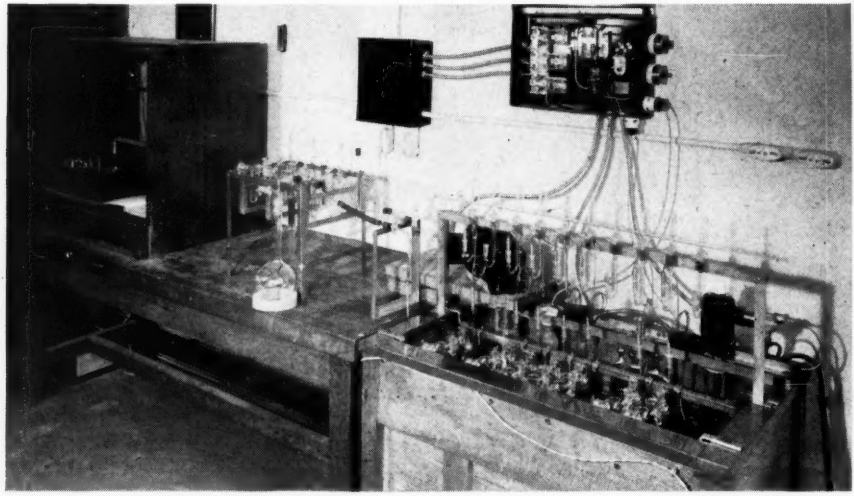
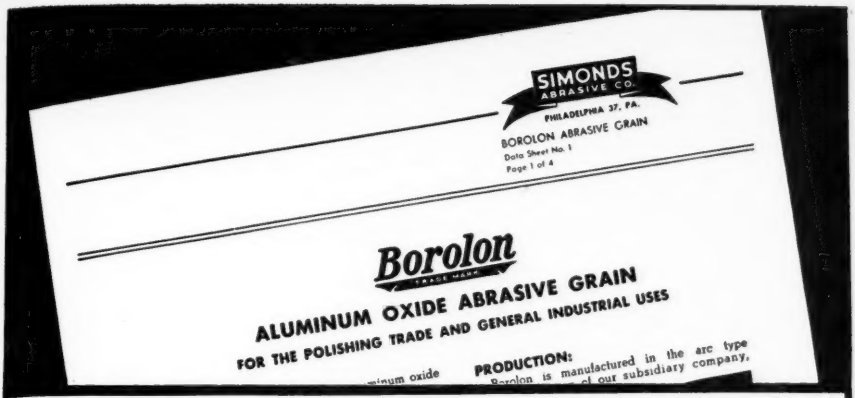
Standardization of the pH Scale

The information presented in this article was prepared by the Technical Reports Section of the National Bureau of Standards.

THE pH unit, used to express numerically the degree of acidity or alkalinity of aqueous solutions, may be defined in a number of ways, each resulting in a slightly different value for the pH of a given solution. Consequently, several pH scales, based upon various definitions, have met with equal favor among chemists. In view of the increasing need in science and industry for accurate determinations of acidity, the National Bureau of Standards is recommending the universal adoption of a single standard pH scale, analogous to the International Temperature Scale. It is proposed that the pH assigned to solutions of buffer substances distri-

Laboratory at the National Bureau of Standards in which electromotive-force data are obtained for the assignment of pH values to solutions of standard buffer materials. These compounds are furnished as Standard Samples for calibration of pH measuring devices and can provide fixed points on a scale of pH. Specially designed glass cells with hydrogen and silver-silver chloride electrodes are filled with the solutions and kept in an accurately controlled constant-temperature bath (at right) while electromotive force is measured on the potentiometer at left. The rack on the table contains cells in position for filling.





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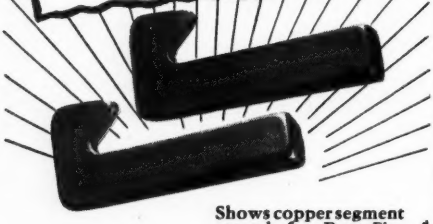
"The savings effected in this one job alone are outstanding. Roto-Finish has enabled us to increase the production of one assembled unit from 94 units per day to 300 per day by releasing five regular operators who ordinarily would be assembling the units from a tedious filing job."



Shows copper segment at top before Roto-Finish deburring and finishing; below after Roto-Finishing.

Mechanical deburring and finishing produces labor savings. Finishes quantities of parts uniformly and accurately. Removes a tedious, time consuming job. Send samples of die castings, sand castings, stampings, machined parts, forgings for processing. (Include finished part for guide.) No obligation!

THE STURGIS PRODUCTS CO.
427 JACOB ST., STURGIS, MICHIGAN

buted by the Bureau as Standard Samples be taken as the fixed points on this standard scale.

In the preparation of many commercial products, the rapidity and efficiency of the processes depend upon accurate control of the acidity or alkalinity of aqueous solutions. In sugar manufacture, the inversion of sucrose can be regulated at will or avoided entirely by holding the acidity within certain limits. Similarly, regulation of the acidity of electroplating solutions permits the character of the deposit to be controlled. Another application of particular importance is the avoidance of corrosion and embrittlement of boiler walls and tubes by regulation of the acidity of boiler water. The widespread losses due to underground corrosion are likewise effectively curbed in many cases by proper adjustment of acidity.

The several convenient pH meters now available commercially enable precise determinations of pH values in such varied media to be made with ease and rapidity, but these values are based upon a scale fixed by the pH assigned to the standards with which the instrument has been calibrated. The differences among scales of pH are the direct result of different procedures, definitions, and assumptions employed in arriving at the pH of the standard. The pH may be defined in one instance as the negative logarithm of the hydrogen-ion concentration or, again, of the effective concentration or "activity" of this ion. Often the pH value as defined by Sorensen in terms of the electromotive force of a galvanic cell with hydrogen and calomel electrodes is chosen. Although the differences among these scales rarely exceed 0.1 unit, the need for greater accuracy makes desirable the general adoption of a single series of consistent pH standards.

In an effort to encourage standard procedure in pH measurements, the

LARGE or SMALL Bonderizing

ANCHORS THE PAINT TO PRESERVE APPEARANCE

ON MOST automobiles manufactured today, Bonderizing guards the smooth beauty of the paint on body, fenders, and sheet metal parts. Makers of quality metal products of all kinds—large and small—use Bonderizing to assure longer lasting finish.

Bonderizing is the standard method for the protection and preservation of fine paint finishes on metal. Bonderizing converts the surface of the metal to a crystalline phosphate coating integral with the metal itself. It is nonmetallic and resists corrosion. It is an excellent base for paint, anchoring the finish securely, and retarding the spread of rust around accidental nicks and scratches. Bonderizing is easily applied, simple to operate and control. It's fast, dependable, and economical.

There's another plus in Bonderizing—a strong sales feature. Bonderizing is *known by name* to the ultimate buyers of your product.

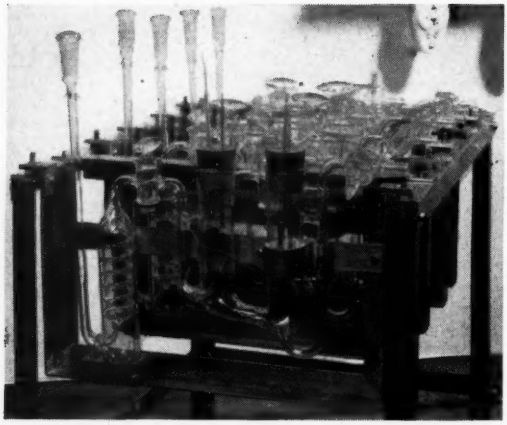
Write for full information about Bonderizing and what it can do for your product.

Bonderite, Parco, Parco Lubrite—Reg. U. S. Pat. Off.

Parker

PARKER RUST PROOF COMPANY
2172 East Milwaukee Ave.
Detroit 11, Michigan

BONDERIZING Holds Paint to Metal . . . PARKERIZING Inhibits Rust . . . PARCO LUBRIZING Retards Wear on Friction Surfaces



Cells without liquid junction designed at the National Bureau of Standards for the accurate determination of the pH of solutions of standard pH samples issued by the Bureau. The electromotive force produced across highly reproducible hydrogen and silver-silver chloride electrodes immersed in the solution (to which chloride has been added) is measured on a potentiometer, and on the basis of a series of such measurements pH values are assigned to solutions of the sample. Hydrogen enters the equilibrator at left, where it bubbles slowly through the cell solution. The gas then finds its way into the hydrogen-electrode compartment. Here it is absorbed on platinum foil coated lightly with spongy platinum, which thus acts as a hydrogen electrode. The compartment at right houses two silver-silver chloride electrodes prepared by partial conversion of metallic silver to silver chloride. Both electrodes are mounted in pairs to permit checking of one set of electrodes against the other. While electromotive force is being measured, the cells are kept in an accurately controlled constant-temperature bath.

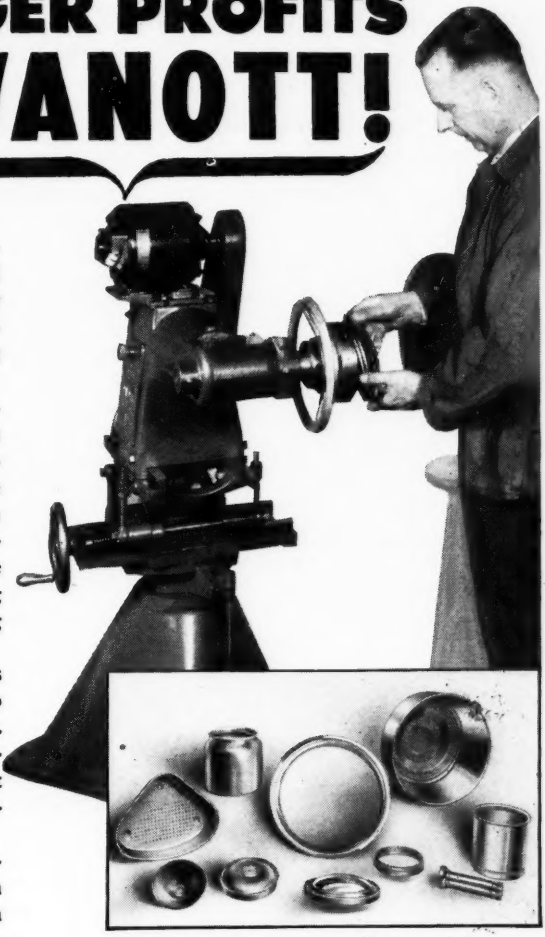
National Bureau of Standards is now supplying four buffer materials in the form of Standard Samples of certified purity. These substances are acid potassium phthalate, potassium dihydrogen phosphate and disodium hydrogen phosphate (intended to be used together), and borax. They are being distributed at the rate of several hundred samples annually. The certificates furnished with these compounds specify the pH of certain aqueous solutions of the sample, which can provide fixed points on a pH scale.

In order to assign exact values to these fixed points, it was necessary to set up a scale based upon some suitable definition of pH. A consideration of the advantages and limitations of several scales led to a choice of a modified activity scale as most convenient and practical for general use. Although the activity of a single ionic species can be simply defined only in very dilute solutions, the influence of the hydrogen-ion activity in chemical equilibria is of far-reaching importance.

The pH of the NBS standards is derived from measurement of the electromotive force of cells without liquid junction, in which they are used as electrolytes. These cells are specially designed, utilizing the highly reproducible hydrogen and silver-silver chloride electrodes. Computation of pH is based upon several reasonable assumed relationships between ionic activities and mean activities. These assumptions are found to provide identical values for dilute solutions. The scale thus obtained approaches a true scale of activity for solutions of low concentration; at higher ionic strengths it is best regarded as a consistent scale which necessarily rests upon an assumption not subject to experimental proof.

"A Study of Free Silica in Dusts Common to the Porcelain Enamel Industry" is the title of a special technical bulletin prepared specifically for porcelain enamelers by the Ferro Enamel Corp., 4150 E. 56th St., Cleveland 5, Ohio. The bulletin is the cooperative work of Dr. Eric Arnold of Case Institute of Technology and consultant for the Ferro research staff, and Russell Frank, safety engineer for the corporation. It is believed that the data and methods reported will be of unusual value to safety engineers in the ceramic industries in solving plant dust problems. Copy of Technical Bulletin No. 7 free.

FOR BIGGER PROFITS
Buff it with a VANOTT!



● Production costs are down—production volume is up—and *profits are bigger*—when your buffing and polishing are handled by a Vanott Semi-Automatic Buffing Machine, Type V-1.

Pots, pans, trays, cylinders—an article of almost any shape and size can be buffed and polished on the Vanott V-1 machine with a finish of uniformly high quality. One man can easily operate two V-1 machines at once—one at either end of buffing lathe or jack—thereby speeding up production.

Heavy and sturdy, the V-1 has all vital mechanism enclosed to protect it from abrasive wear. Swiveling of the head is performed automatically by foot pedal—a special ease-of-operation feature.

We'll be glad to make a production-cost estimate based on samples of your work in rough and finished condition. No obligation, of course.

Write for further information or send samples for our estimate.

Typical examples of the wide variety of shapes handled on the Vanott V-1 machine.

VANOTT MACHINE CORP.
222 Colgate Avenue
Buffalo 20, New York

PRACTICAL APPLICATIONS *of Modern Products*

Testing Instrument Measures Porcelain Enamel Adherence by Magnetic Counting

A TESTING device for measuring the adherence of porcelain enamel to base metal by means of magnetic counting has been developed by the

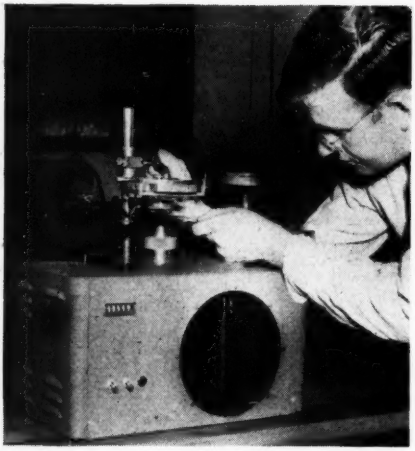


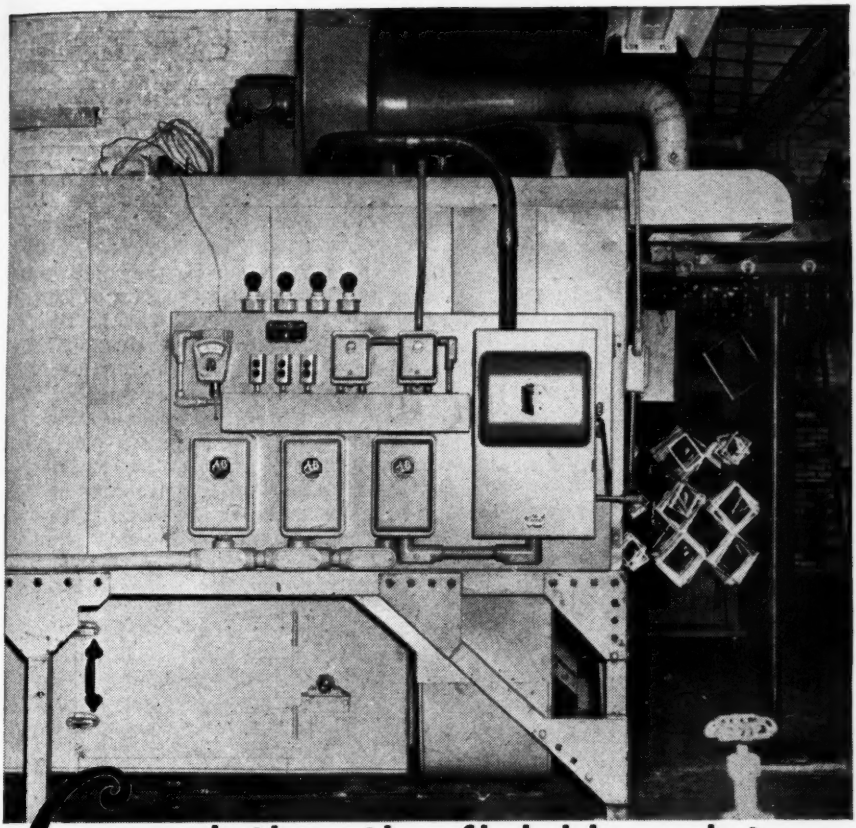
Illustration showing porcelain enamel adherence tester in use

Research Foundation of the Porcelain Enamel Institute in the National Bureau of Standards. The instrument is primarily designed to supplement the conventional fracture test for adherence and provide more complete data on the impact characteristics of the various porcelain enamel coatings.

The tester unit is assembled in one piece, consisting of a test head, stand, and specimen holder mounted on the control cabinet which contains the power supply, selector switch, and magnetic counter. The test head is of molded plastic and contains 169 spring-actuated steel probes, individually connected to respective segments of the selector switch. The mass of probes, similar in appearance to the face of a fine wire brush, is arranged in a hexagonal pattern, 0.10 inch on centers.

In operation, a ground wire is attached to the specimen to be tested and the test head lowered onto the test surface, the spring-actuated probes adjusting to the contour of the test area. A synchronous motor actuates the selector switch and each circuit, in turn, is automatically tested. If a given probe comes in contact with exposed metal, a relay activates the magnetic counter, thus recording the attraction of that particular probe to the surface. Computation of the adherence of the test area as a whole is easily carried out by determining the number of probes affected and the degree to which they are affected.

In addition to computing the numbers of probes contacting bare metal, analysis of the patterns of exposed metal indicates how porcelain enamel, in a multitude of thicknesses and compositions, reacts to varying degrees of impact.



Completing the finishing picture

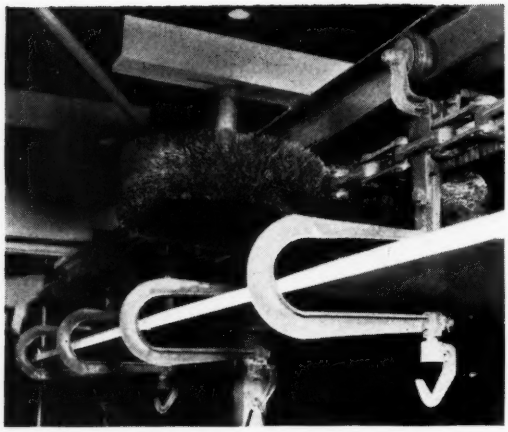
. . . WITH A KIRK AND BLUM INDUSTRIAL OVEN!

• This Kirk & Blum conveyor-type oven is installed at S. E. Overton Co., South Haven, Michigan to dry picture frames. Increased production . . . improved finishes . . . savings in floor space, fuel and labor . . . all these are demanded by modern finishing operations. That "cover-all" requirement is the reason so many plants are installing KIRK & BLUM Industrial Ovens for drying and baking processes.

Accurate engineering data, pertaining to every type of oven equipment, has been acquired by KIRK & BLUM through 40 years of experience. Descriptive Bulletin 0, "Industrial Ovens," illustrates and describes many KIRK & BLUM installations, large and small. Write for your copy today. The Kirk & Blum Mfg. Company, 2816 Spring Grove Ave., Cincinnati 25, Ohio.

KIRK AND BLUM

INDUSTRIAL OVENS



In General Electric's refrigerator plant at Erie, Pa., the disc-center circular wire brush sections shown in this setup eliminate the problem of scale deposits on the conveyor chain and keep the chain free of excess grease and dirt, thus reducing production interruptions formerly necessary for maintenance and general cleaning.

Simple Brushing Setup Descales Conveyor Chain

A UNIQUE power brushing technique that reduces conveyor chain maintenance and offers substantial savings in operating and other maintenance efficiency is being used in the refrigerator plant of the General Electric Co., Erie, Pa. The brushing setup, which operates in conjunction with the plant's new conveyor assembly, is designed to eliminate the problem of scale deposits on the conveyor chain, which passes through a rust-proofing solution at one stage of the assembly process.

Two Osborn disc-center circular wire brush sections, 15 inches in diameter and containing 0.014-gauge wire, are mounted on each side of the conveyor chain, as shown in the accompanying illustration, to contact the chain just after it emerges from the phosphatizing bath. Not only do the brush sections provide for removal of the scale deposits, but also excess grease, oil, and dirt which accumulate in regular service.

The plant's conveyor chain is one of the longest in the country and travels at the rate of 27 feet per minute. Prior to the introduction of the brushing method of descaling the chain, it was necessary to halt production periodically, remove the chain from the conveyor, and clean it in a caustic solution. One of the outstanding advantages of the brushing setup is that no special power mechanism is required to operate it. The brushes revolve with the chain, cleaning it continuously as the production line moves.

"Where Monel Pays Its Way in Pickling" is the title of a six-page folder now being distributed by The International Nickel Co., Inc., 67 Wall St., New York 5, N. Y., which illustrates and describes various types of Monel crates, baskets, tanks, chain, and miscellaneous equipment and their use in performing pickling operations. The engineering properties and fabrication of Monel are discussed in the final page of the folder, copy of which is available free upon request.

Vanott Buffing and Polishing Machines. The Vanott Machine Corp., 216 Colgate Ave., Buffalo 20, N. Y., now has available two four-page circulars, one of which illustrates and describes an eight-spindle machine for automatically buffing and polishing parts up to 3 inches in diameter. The other circular presents similar data on a single-spindle machine for the semi-automatic buffing and polishing of larger work than can be handled by the eight-spindle machine. Copy of either or both circulars free.

Like Magic—DARCO Keeps Them Crystal-Clear

When DARCO* has removed the colloids and organic matter *not* removed by mechanical filtration methods, your solution will come out clean and crystal clear.

A little DARCO goes a long way! A few cents' worth purifies a hundred gallons of solution. Use it in conjunction with your filter to purify plating baths for bright nickel, copper, iron, zinc, cadmium, tin, gold and silver.

DARCO is America's oldest trade mark for activated carbon. It stands for a quality product. Moreover DARCO technicians will answer your questions concerning ways to increase quality and production.

DARCO

Is your plating bath as clean as the water used in your final rinse?

DARCO CORPORATION

*Darco—Reg.U.S.Pat.Off.

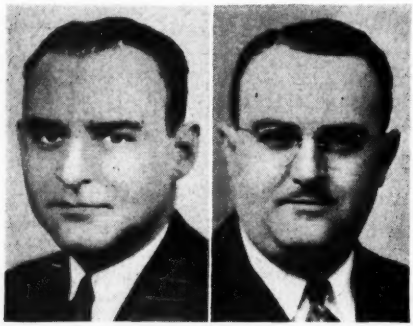
60 E. 42nd Street, New York 17, N. Y.

NEWS of the Industry

Promotions at Detrex

W. F. Newbery, formerly industrial sales manager, has been appointed assistant director of sales of the Detrex Corp., Detroit 32, Mich., according to an announcement by W. W. Davidson, vice president and director of sales.

Reporting directly to Mr. Newbery will be LeRoy Camel, the new sales manager of the Industrial Products Division, including metal cleaning equipment and chemicals; H. S. Tweedy, industrial service manager; H. J. Lucey, oil-extraction and export sales manager; and G. W. Walter, advertising and sales promotion manager.



(Left) W. F. Newbery (Right) LeRoy Camel

Three Sales Personnel Changes

Three sales personnel changes in the Special Chemicals Division of the Pennsylvania Salt Manufacturing Company, including the appointment of Albert H. Clem to a newly-created position of field sales supevisor, have been announced by Joseph J. Duffy, Jr., manager of sales. Mr. Clem in his new position will supervise activities of the district sales managers and all field men of the division. A graduate of Pennyslvania State College with a degree in chemical engineering, Mr. Clem has been with Pennsalt since 1938, when he became Detroit sales representative.

Philip C. Staples Jr., who has been with the company since 1937, will succeed Mr. Clem as product supervisor on cleaners and pickling and descaling products. A Harvard University graduate, Mr. Staples brings to his new assignment a variety of experience, including service in the company's student training course, technical service department, and sales department, having formerly been product supervisor of another group of Special Chemicals Division products.

Succeeding Mr. Staple as product supervisor on corrosion-resistant products will be Robert R. Pierce, a graduate of Oregon State College, with a degree of chemical engineering, who joined Pennsalt in 1941.

Change in Corporate Name

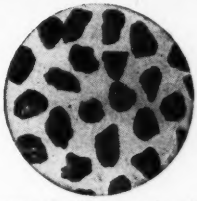
Sapolin Paints Inc. announces a change in its corporate name. Formerly known as Sapolin Co. Inc., the company's new name, Sapolin Paints Inc., was adopted January 2, 1948.

Officials of the company point out that with this change the corporate name becomes more descriptive of the nature of the business and more closely follows common usage. The company's ownership, management, personnel, and policies remain as before.

Sapolin Paints Inc. has its executive offices at 229 E. 42nd St., New York 17, N. Y. The Sapolin plant is located at 183-217 Lorraine St., Brooklyn 31, N. Y. Warehouses are maintained in Plymouth, N. C., Jacksonville, Fla., Houston, Texas, and Los Angeles, California.

EXOLON IS THE ABRASIVE FOR *FAST METAL POLISHING*

ACCURATE GRADES... IRON PARTICLES REMOVED



Photomicrograph of Exolon RST Polishing Grains.

Exolon Aluminum Oxide Abrasives are available for polishing all types of metals.

The special production facilities at the new Exolon plant provide unsurpassed uniformity of grading (size and shape) in all standard sizes; assuring fast and satisfying polishing results.

Due to its greater freedom from magnetic particles, Exolon is a more efficient grain for polishing stainless metals...a safer material to use since ferrous materials will not become embedded in the surface. Write for Exolon's folder on polishing procedures and recommendations.

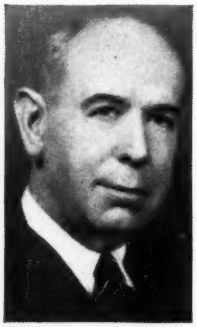
THE EXOLON COMPANY

943 E. NIAGARA ST. TONAWANDA, N. Y.

Manufacturers of SILICON CARBIDE and ALUMINUM OXIDE ABRASIVES

Field Technical Engineer Appointed

Thomas C. Bradford has been appointed to the position of field technical engineer by The Anderson Oil Co., Portland, Conn., maker of Lusol coolant and RustAvoid preservatives.



Thomas C. Bradford

Mr. Bradford has twenty years of experience in the industrial oil and tool industry. He has represented The Anderson Oil Company in the New England area since 1938, during which time he has been an active member of the American Society of Tool Engineers, American Society for Metals, and Army Ordnance Association.

Dayton Branch of A.E.S. to Hold Annual Educational Session

The Dayton Branch of the American Electroplaters' Society will hold its Third Annual Educational Session and Dinner Party on February 14, 1948 at the Miami Hotel in Dayton. Walter E. Moline of the National Cash Register Company and William G. Cryderman of the Hanson-Van Winkle-Munning Company are co-chairmen.

Arrangements have been made for the following speakers and topics on the program for the educational session which will start at 2 p. m.: Bernard C. Case, Hanson-Van Winkle-Munning Company ("Electrolytic Purification of Solutions"); M. C. Welker, American Cyanamid & Chemical Corporation ("Demineralized Water in the Plating Room"); and M. L. Moll, Mine Safety Appliances Company ("The Air We Breathe," a 32-minute film).

The dinner party will start at 6:30 p. m. in the main ballroom of the Miami Hotel. Music will be furnished by Earl Holderman's orchestra, and further entertainment has been planned. The dinner is $5.00 per plate.

Dr. George Kahan Joins Lea

The Lea Manufacturing Co., Waterbury 86, Conn., announces that Dr. George J. Kahan has joined the Lea technical staff to conduct electrochemical research work. Dr. Kahan is well known for his activity as project director of the A.E.S. Research Project No. 4 on "The Effect of Surface Finishing on the Protective Value of Electrodeposited Coatings." He will continue as project director until completion of the project.

Dr. Kahan received his degree as doctor of natural science at the University of Prague, Czechoslovakia. He later studied polarography under the internationally known Dr. Heyrovsky in Prague for two years, and subsequently for three years at the University of Minnesota. In 1939 he joined the research staff of the Chromium Corporation of America. Since 1941, Dr. Kahan has been associated with the U. S. Time Corporation and worked on chemical and material problems.

Midwestern Regional Director

The Mitchell-Bradford Chemical Co., 2446 Main St., Stratford, Conn., has announced the appointment of George F. Kahle as Midwestern regional director, with offices at 11 W. Jackson Blvd., Chicago, Ill. Mr. Kahle is a graduate chemical engineer from the Illinois Institute of Technology. Prior to the war he was engaged in sales engineering and development work for the Lithgow Corporation and Cardox Corporation. During the war, Mr. Kahle was a senior engineer with the Office of the Chief of Ordnance, Safety & Security Division. Directly before joining Mitchell-Bradford, he was a technical and sales representative for The Heyden Chemical Corporation.

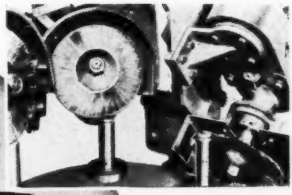
George F. Kahle

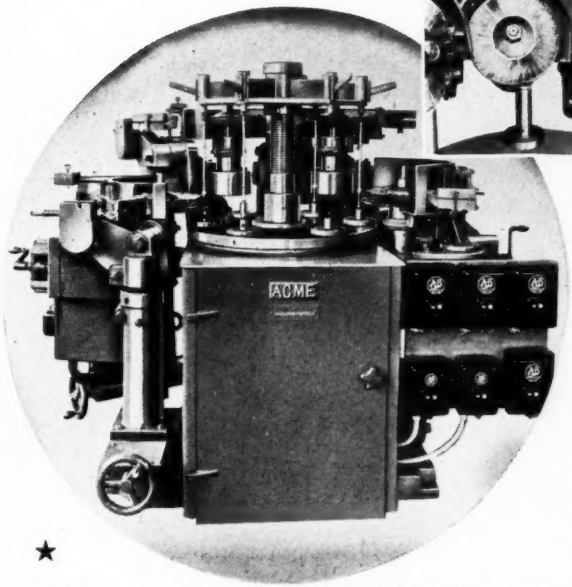
Mr. Kahle brings to his new position broad technical sales and development experience and has assumed the duties of managing Mitchell-Bradford's Chicago office and coordinating the Midwestern sales and service organization.

ROTARY AUTOMATICS • SEMI-AUTOMATICS • STRAIGHT LINE AUTOMATICS

• FOR HIGH PRODUCTION POLISHING AND BUFFING •

Small **ROTARIES** *can make*
BIG REDUCTIONS *in Production Costs!*





Above — 30 inch Acme Rotary used to produce satin finish on such work as watch cases.

★

A 30 inch, 6 station, Acme Rotary indexing machine with special tailstock arrangement for buffing each end of long threaded studs.

★

Our latest catalog of* ROTARY AUTOMATICS *will be sent on request. Write for it.

★

ACME Small Rotaries are expertly engineered to deliver consistent high production. Their efficiency on a wide variety of jobs has brought these machines into wide use where costs must be held to a minimum. **ACME** has engineered and built polishing and buffing machines for virtually every type and size of job. Small Rotary or other type arrangements are planned by **ACME** to meet the individual mechanical and production requirements of the specific job.

SPECIAL MACHINERY AUTOMATIC BUFFING MACHINES

ACME *Manufacturing Co.*
1645 HOWARD ST. DETROIT 16, MICH.
Builders OF AUTOMATIC POLISHING AND BUFFING MACHINES FOR OVER 35 YEARS

Acquires Newcomb Engineering Company

The Newcomb-Detroit Co., 5741 Russell St., Detroit 11, Mich., engineer and manufacturer of finishing and dust-arresting systems, announces the acquisition of the Newcomb Engineering Co., Grand Rapids, Mich., which will now be known as the Grand Rapids Division. In 1908, C. B. Newcomb founded the Grand Rapids Blow Pipe and Dust Arrestor Company which later became the Newcomb Engineering Company. In 1911, Mr. Newcomb also founded the Newcomb-Detroit Company to engineer and manufacture dust-arresting and finishing systems for the automotive industry. Both companies, until now, have operated as separate corporations.

(Left) Richard W. Wenzell (Right) Ian B. Mac Lellan

Ian B. Mac Lellan has been appointed general manager of the company. Mr. Mac Lellan has been with Newcomb-Detroit since 1919 and is president of the Associated Metal Fabricators and Engineers of Detroit.

Richard W. Wenzell has been appointed manager of the Grand Rapids Division. Mr. Wenzell was formerly plant engineer of the General Motors Truck and Coach Division.

Expands Plating Equipment and Supply Line

Industrial Lining Engineers, Inc., Sewickley, Pa., has expanded its line of established products and services to include products manufactured by the Belke Manufacturing Company, Crown Rheostat & Supply Company, General Electric Company, Wyandotte Chemicals Corporation, United Chromium, Incorporated, Sparkler Manufacturing Company, Manderscheid Company, American Buff Company, Neilson Chemical Company, Duluth Buff Company, Alsop Engineering Corporation, Kirk & Blum Manufacturing Company, Platecoil Division of Kold-Hold Manufacturing Company, and other leading manufacturers of plating equipment and supplies.

The firm's newly created Electroplating Sales Division, headed by W. B. Williams, is now in a position to offer sales and service, technical engineering, and fast delivery of all plating and finishing room equipment and supplies.

Midland Promotes Two Men

M. A. Glaser, technical director, Midland Industrial Finishes Co., Waukegan, Ill., announces the promotion of Edward Miller to chief chemist of the company's laboratories. Mr. Miller will be in charge of development and research work in the lacquer, synthetic, and specialty fields.

Edward J. Bromstead has been promoted to group leader and will be in charge of the development and formulation of products from the metal decorating laboratory. The company has also increased its representation in sales by several additions to its force. Moreover, improvements have been made in plant facilities with the acquisition of new mills and other processing equipment.

(Left) Edward Miller (Right) Edward J. Bromstead

Cleaned and phosphate-coated with "Duridine", these sheet steel range shells have acquired a thin, tight, hard, crystalline phosphate coating—the ideal preparation for long finish life and enduring beauty.
Photograph by courtesy of Hotpoint, Inc.

CHEMICALS ACP PROCESSES

RUST PROOFING AND PAINT BONDING

Granodine *
Duridine *
Aladine *
Lithoform *
Thermoil-Granodine *

RUST REMOVING AND PREVENTING

Deoxidine *
Peroline *

PICKLING ACID INHIBITORS

Rodine * ®

Chemicals for Rust Proofing Paint Bonding

American Chemical Paint Co.

TECHNIGRAM

AMBLER, PA.

Pickling Acid Inhibitors Rust Removing Preventing

To: Those Interested in Metal Cleaning -- Phosphatizing

Address: Everywhere -- Anywhere

"DURIDINE"*-- for effective cleaning -- phosphatizing -- establishing lasting paint bond -- preventing rust. Rapid -- economical -- simple -- sure. Used in power spray washers of mild steel -- coats surfaces with a uniform crystalline non-conductive phosphate layer. Investigate "DURIDINE" -- specify "DURIDINE". Full information on request.

Be sure to check on "DURIDINE" -- and the entire ACP family of metal treating chemicals -- for economical -- effective -- rapid production.

Pioneering Research and Development Since 1914

AMERICAN CHEMICAL PAINT COMPANY

AMBLER, PENNA.

ACP

Manufacturers of Metallurgical, Agricultural and Pharmaceutical Chemicals

A. F. Fletcher Joins Enthone

Austin F. Fletcher has been appointed sales engineer for Enthone, Inc., 442 Elm St., New Haven 2, Conn. Mr. Fletcher will service Central and Western New York State, including Binghamton, Syracuse, and Rochester.

Mr. Fletcher received his education in New Jersey and studied electroplating at Mechanics Institute in Newark. He started in the plating industry in 1925 with the Elevator Supply Co., Hoboken, N. J. For several years, he was a chemist with the Superior Metal Co., Bethlehem, Pa. From 1931 to the date of joining Enthone, he was plating superintendent for the Brewer Titchener Corp., Binghamton, N. Y.

Austin F. Fletcher

Mr. Fletcher has a wide acquaintance in the electroplating industry, being an active member of the A.E.S. He was vice president of the Newark Branch of the A.E.S. and was supreme vice president of the society. He was also one of the founders of the Binghamton Branch, which later became the Syracuse Branch.

A.G.A. Spring Conference

The annual A.G.A. Sales Conference on Industrial and Commercial Gas will be held this year in Windsor, Ontario, Canada, April 7, 8, and 9, according to an announcement by Leon Ourusoff, chairman, Industrial and Commercial Gas Section, American Gas Association. An outstanding program has been prepared by the Section's Program and Papers Committee under the chairmanship of Harry A. Sutton .

Following last year's pattern, the three-day conference will be divided to cover different phases of the gas industry. The first day, Wednesday, April 7, will be given over entirely to industrial gas subjects. On Thursday, April 8, the morning and afternoon sessions will cover subjects of general interest to all gas men, and a formal luncheon will take pace on that day. On Friday, April 9, only commercial gas subjects will be discussed.

Du Pont Personnel Changes

Four major personnel changes in the Electrochemicals Department are announced by E. I. du Pont de Nemours and Co. Inc., Wilmington 98, Del. Donald O. Notman, who has been director of the Technical Division, becomes assistant general manager. He succeeds Samuel G. Baker who became general manager with the retirement of F. S. MacGregor after more than 30 years with the company.

Dr. E. A. Harding, who has been director of production, becomes director of the Technical Division, succeeding Mr. Notman. Russell L. Hardy, manager of the Niagara Falls, New York plant, becomes director of production, and Dr. N. C. Jones, assistant manager of the plant, succeeds Mr. Hardy.

Udylite Appoints Sales Engineer

Galen S. Woodruff has been appointed sales engineer in the Cleveland office of The Udylite Corporation, according to an announcement by L. V. Nagle, vice president and sales manager. Mr. Woodruff comes to Udylite from Lincoln Industries where he was a foreman plater. He has a broad industrial background, and in 1945-46 served in the U. S. Navy.

Galen S. Woodruff

Mr. Woodruff received his advance educational training at the RCA Institute.

New Location for U-C Los Angeles Branch

United Chromium, Inc., 51 E. 42nd St., New York 17, N. Y., announces the removal of its Los Angeles offices and warehouse to 923 E. Third St., Los Angeles 13, Calif. According to R. J. Wooley, district manager, this central location will facilitate service on orders for "Unichrome" finishing and maintenance materials and also the rendering of technical service on metal-finishing problems.

POWER
ON A PIN-POINT

Over a Thousand Amps per Square Foot

★

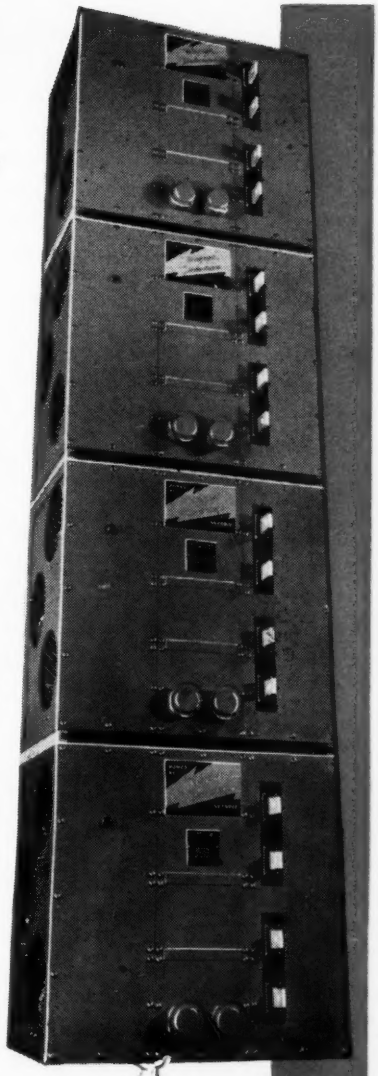
WAGNER-TIEDEMAN RECTIFIERS DELIVER THE GOODS AT LOW COST BECAUSE:

1. Installation is simple and flexible. Power may be concentrated where needed, eliminating single unit high amperage systems.

2. Feed lines smaller. Light in weight, easily handled. No costly foundations. Utilize vertical, rather than horizontal space.

3. Anyone can service. Everything visible. Parts and service in 24 hours. Eliminate entire plant tie-ups.

4. Produce low voltage high amperage Direct Current from Alternating Current source for less money – with complete satisfaction.



Cells will handle momentary overload up to 1000% of normal. Over 4300 sq. in. effective rectifying area. Three 40-watt cooling fans. Two-winding transformer. 6v at 1500 amp; 12v at 750 amp. Write today for our new engineering memorandum for full specifications and operating details.

Wagner BROTHERS INC.

METAL FINISHING EQUIPMENT

POLISHING AND PLATING MATERIALS

432 Midland Avenue

Detroit 3, Michigan

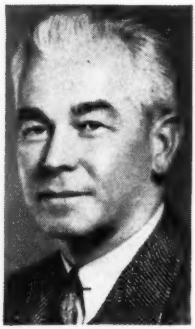
TUlsa 3-0100

Hansen Transferred to California

The Ferro Enamel Corp., Cleveland 5, Ohio, announces the transfer of J. E. Hansen, long-time director of technical service and assistant secretary of the corporation, to Los Angeles where he will assume complete charge of Ferro's California manufacturing operations. Mr. Hansen brings to his new post a diverse and distinguished record of achievement. Graduating from the University of Illinois in 1920, he did development work on porcelain enamels for a group of stove manufacturers as an Industrial Fellow at the Mellon Institute of Industrial Research, Pittsburgh, Pennsylvania.

In 1926, Mr. Hansen joined Ferro as a research engineer and was advanced to assistant service director in 1932 and to service director in 1935. A frequent contributor of articles to the publications of the American Ceramics Society, Mr. Hansen was elected a Fellow of that organization in 1931, later serving as vice president (1945-46) and president (1946-47). During World War II, he designed, built, and managed the Powdered Metals Division of Ferro Enamel Corporation at Bedford, Ohio. Since then, he has performed the dual role of director of technical service for Ferro and editor of "The Enamelist," published by the Enamelist Publishing Company.

Buckeye Products Representative



Lowell S. Fisher

Lowell S. Fisher is now representing The Buckeye Products Co., Cincinnati 16, Ohio, in Central Indiana, handling the company's line of "Speedie" buffing and polishing compositions. With more than 24 years of experience in the metal-finishing industry, Mr. Fisher is well qualified to engineer the many and varied types of problems which are presently being faced by both job and production shops.

Mr. Fisher served in World War I and has taken an active part in veterans' organizations in Indianapolis.

Blake Elected Vice President

Dudley B. Blake has been elected vice president in charge of advertising and sales for The Monroe Sander Corp., Long Island City, N. Y., manufacturer of industrial finishes, synthetics, and paints. He was formerly assistant to the president.

Mr. Blake has stated that the firm will soon open offices in Cleveland and Buffalo to facilitate servicing of accounts in those areas.

Dudley B. Blake

Dr. David H. Dawson Honored

Dr. David H. Dawson, director of sales of the Pigments Departments of the Du Pont Company, was awarded the honorary degree of doctor of engineering by the Drexel Institute of Technology at the institution's Founder's Day convocation in December. He is a graduate of Drexel and received his doctorate from Ohio State University.

In connection with his undergraduate studies, Dr. Dawson performed analytical work, plant research, and general research at laboratories in the Philadelphia and Wilmington areas. He received his bachelor of science degree in chemical engineering in 1930.

Sherwin-Williams Industrial Sales Executive Dies

Neal S. Baldwin, assistant to the general manager of industrial sales, The Sherwin-Williams Company, died January 17 at his home in Cleveland. Born in Akron, Mr. Baldwin was employed in Chicago by the Glidden Company before joining Sherwin-Williams in 1940. He had been in industrial sales since that time except for a three-year leave of absence when he served as a U. S. Navy Lieutenant during the war. Upon his return from service in December 1945, Mr. Baldwin was made assistant to the head of industrial sales.

Why ACME, KOCH-Built Spray Booths

LEAD THE FIELD

- **EXHAUST CLEAN AIR!**
  A self-cleaning eliminator cuts maintenance costs by flushing and cleaning constantly.

- **ELIMINATE FIRE HAZARD!**
  By preventing the accumulation of over-spray throughout booth and in the fans and stacks.

- **EASY TO INSTALL!**
  The entire water-wash section is shipped completely assembled with pump mounted, all piping, fans, motors and drives in place. Standard enclosure panels may be bolted on the front to extend the enclosure to any depth required.

WHAT ARE YOUR REQUIREMENTS?

Let KOCH engineers study your spray booth requirements and recommend the proper booth to give you top efficiency in your plant.

Phone, Wire or Write Today for Complete Details

GEORGE KOCH SONS, Inc.

INDUSTRIAL EQUIPMENT

EVANSVILLE, INDIANA, U. S. A.

Sales offices in leading industrial centers:

NEW YORK
William Printz Co.
350 Fifth Ave.

★

CHICAGO
Koch Indust. Equip., Inc.
53 W. Jackson Blvd.

★

LOS ANGELES
Industrial Systems Co.
341 S. Central Ave.

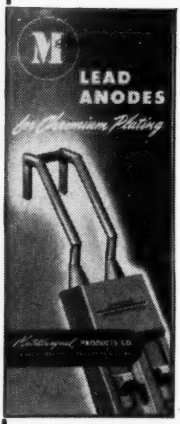
IFMA Appoints Prize Contest Judges

The appointment of judges of the current $1,500.00 Prize Contest sponsored by the Industrial Furnace Manufacturers Association, Inc., 430 Lexington Ave., New York 17, N. Y., for the best published article on industrial furnace, kiln, or oven applications has been announced by C. H. Stevenson, Lindberg Engineering Company, Chicago, chairman of the special committee of the Association selected to nominate the judges. The five judges who will select the three major prize articles, as well as award a number of honorable mentions for the best articles in specific fields, following close of the contest October 1, 1948 are: Alexander H. D'Arcambal, vice president and consulting metallurgist, Pratt & Whitney Division, Niles-Bement-Pond Co., West Hartford, Conn.; Dr. E. S. Davenport, assistant to vice president, United States Steel Corp., Pittsburgh, Pa.; George W. Mason, president, Nash-Kelvinator Corp., Detroit, Mich.; R. H. McCarroll, director of chemical engineering and chemical and metallurgical research and chairman of the Industrial Engineering Committee, Ford Motor Co., Dearborn, Mich.; and Dr. S. R. Scholes, Dean, New York State School of Ceramics, Alfred University, Alfred, New York.

Nomination of the judges by the committee was stated by the chairman to be based not only upon the desire to appoint men of recognized standing in industry, but also upon obtaining as broad a coverage as possible of the many fields in which industrial furnaces and ovens of various types are used, since the contest is open to the personnel of any company utilizing furnaces or ovens in industrial applications. The contest was opened for original articles published after October 1, 1947, and will continue to include those published in the United States up to September 30, 1948, inclusive. Awards will be made by the judges on or before February 1, 1949. Articles relating to the specific advantages obtained by the use of modern industrial furnaces, kilns, or ovens for heat treating, processing or melting are eligible. Technical society articles subsequently published in a trade paper also will be considered. Members of the furnace industry are excluded from the competition, as are articles describing experimental developments not in commercial use.

A complete copy of the contest rules may be obtained from the Association.

IT'S NEW . . .



CONDUCTA-CORE
Lead Alloy Anodes

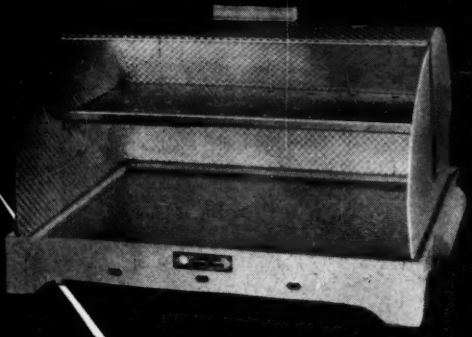
▶ Know all about its features . . . write Metallurgical for a copy of the new folder "M Sterling Lead Anodes for Chromium Plating." Always be sure of getting all the advantages and you'll get better results . . . use M Sterling Conducta-Core Anodes for the best Chromium Plating . . . no warp, crack, peel, bend, or scale. And, they are *Dated* . . . proof of long-life. Write now!

***Metallurgical* Products Co.**
Est. 1909
35th & Moore Sts., Philadelphia 45, Pa.

Spring Open Educational Session

The Newark Branch of the American Electroplaters' Society announces that its Spring Open Educational Session will be held on March 5 at the Robert Treat Hotel, Newark, N. J. A very interesting and educational program has been arranged and will include the following speakers: W. H. Jackson, The Udylite Corporation ("Horizontal Plating Barrels and Auxiliary Equipment"); Dr. George Dubpernel, United Chromium, Inc. ("Chromium Barrel Plating"); and Kenneth Huston, Rustless Iron & Steel Corporation ("Research Program of the A.E.S.").

Stonhard Resurfacer, a heavy duty material for repairs and overlays to concrete and wood floors, is the subject of a 12-page folder published by the Stonhard Co., 403 N. Broad St., Philadelphia 8, Pa. Illustrations show several typical installations and demonstrate the versatility of the material in solving floor problems for a variety of industries. Copy free upon request.

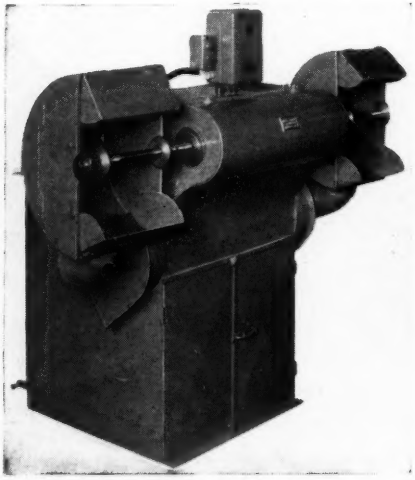


Fudge
SIREN
HOT FUDGE
SUNDAES
EMERGENCY

New Equipment and Materials

Del Double-Spindle Buffing and Grinding Lathe

Production of a double-spindle buffing and grinding lathe with integral dust collector has been announced by the Del Speed Lathe Co., 9-11 Belgium St., Newark 3, N. J. The unit is available in a series of three sizes based upon motor capacities to meet the needs of both large production and small shops. The motor sizes are 2 to 5, 5 to 7½, and 7½ to 10 h.p. A speed range of from 500 to 3,600 r.p.m. can be obtained. A magnetic push-button control provides for instant starting and stopping of the machine.



Del Double-Spindle Buffing and Grinding Lathe

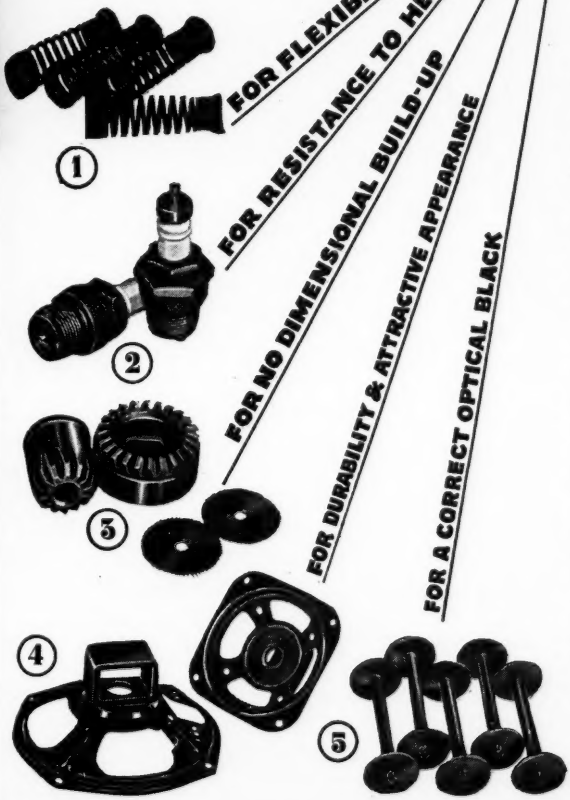
The Del Double-Spindle Buffing and Grinding Lathe is available in overall spindle lengths of 4, 5, and 6 feet, with the spindles made of polished ground U.S.E. steel. The machine is designed to handle buffs up to 16 inches in diameter and to provide ample capacity between flanges of each spindle (approximately 8 inches) to permit the use of several different buffs on each spindle. Roughing and final finishing operations can thus be performed simultaneously by the operator. Each spindle hood is equipped with adjustable flaps to assure control of dust collection and protection for the worker. Work in process can be handled directly under the wheel or very close to the spindle at either side of the machine. Such an arrangement is said to be ideal for polishing long articles.

Dust removal is effectively provided by two 10-inch fans, one for each end of the spindle and powered by the same motor that drives the spindle. The dust collecting system includes a spun glass breather with manual shaker. A 5-inch intake pipe is employed for each spindle and, in operation, the dust is drawn off and accumulated into a single central compartment located at the base of the machine. Double hinged doors on the front of the unit facilitate cleaning.

The Del Double-Spindle Buffing and Grinding Lathe is of sturdy all-welded heavy steel fabrication and measures 26 x 26 inches at the floor line.

A New Horizon for Metal Finishing

BLACK MAGIC



Lift your product out of the "everyday" class by using BLACK MAGIC single-bath oxide black!

1. Black Magic, a rich, permanent black finish, is extremely flexible and can be applied to springs and similar wire products. It will not chip or flake off but becomes an integral part of the metal surface.

2. High resistance to heat is vital in spark plug finishes. Black Magic, a tough, heat resistant and rust inhibiting finish, is used regularly where heat changes are frequent and extreme.

3. As a protective finish for gears and small parts, where tolerances are important, Black Magic covers completely, yet effects no dimensional change.

4. Durable, attractive in appearance, Black Magic's smart black adds greatly to sales appeal and service life of radio parts. The deep-penetrating, single-bath oxide is economical, easy to use.

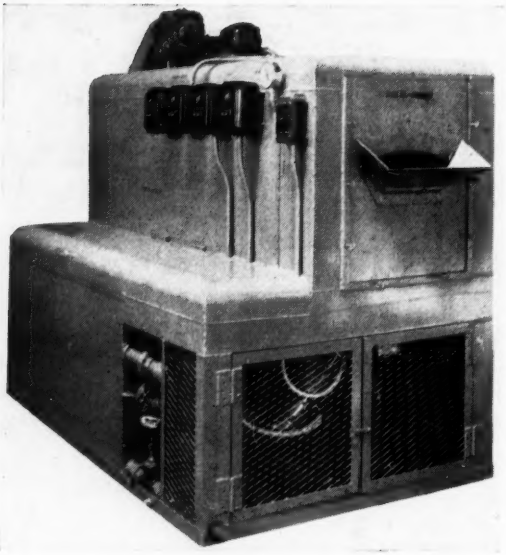
5. For exacting specification work in optics, Black Magic is a consistent performer. After subsequent processing, Black Magic makes possible the non-reflective, optical black required in optical instruments.

Write for the "Black Book" of details on Black Magic for iron and steel, copper and its alloys, zinc and cadmium.

MITCHELL-BRADFORD CHEMICAL COMPANY
MODERN METAL FINISHES
• 2446D MAIN ST., (Stratford) BRIDGEPORT, CONN. •
CHICAGO OFFICE: 111 W. Jackson Blvd.

BLACK-MAGIC OXIDE BLACKING SALTS
WITCH-DIP & WITCH-OIL FINAL FINISHES

SILCO *Glass-Base* PROTECTIVE COATING
HEAT TREATING SALTS, CLEANERS, ETC.



Industrial Continuous Rotary Drum Type Washing Machine

Industrial Continuous Rotary Drum Type Washing Machine

The Industrial Washing Machine Division, Metal-Clean Solvent Corp., 1935 N. Paulina St., Chicago, Ill., announces a continuous rotary drum type washing machine that is available in three sizes, the smallest of which is a continuous spiral rotary drum type unit 3½ feet long. The next size is a 6-foot long wash and dry machine, as shown herewith, while the largest size is a 9-foot long wash, rinse, and dry unit.

According to the manufacturer, the Industrial Continuous Rotary Drum Type Washing Machine is built to process 700 to 900 lb. of small metal stampings or screw machine parts per hour, is completely automatic in operation, and is designed for easy maintenance and clean-out. Compactly constructed so as to conserve space, the machine is made of high quality materials and can be used in producing batches of material or continuous-flow production.

ILE Foam Blanket Chips

For the suppression of foam in all types of aqueous solutions or baths, Industrial Lining Engineers, Inc., Sewickley, Pa., is now offering foam blanket chips which are said to be particularly well adapted for electroplating chrome baths. The chips float on the surface of the solution, thereby reducing the exposed solution surface and, by their motion, mechanically destroy foam as it is formed. The mobile blanket thus provided is said to readily part to permit work to be introduced into or withdrawn from the bath.

The ILE Foam Blanket Chips are made of plastic and are each approximately 2 inches long x 1 inch wide x $\frac{1}{16}$ inch thick. The chips have a slight curvature to prevent them from clinging to wet tank walls or to work and racks traversing the bath, and are large enough to permit their ready removal from the solution by screening or scooping. The chips are said to be resistant to all acids (except hot concentrated nitric acid), all alkalis, inorganic salt solutions, and organic solvents. They swell slightly in hydrocarbons but will not dissolve or disintegrate, it is claimed. In addition, the chips are claimed to be tasteless, odorless, and to contain no toxic ingredients.

According to the manufacturer, ILE Foam Blanket Chips are suitable for use in baths or solutions operating at temperatures up to 230 deg. F. At temperatures between 180 and 230 deg. F. they become softer and more pliable but will not melt or stick together in use, it is stated.

Radiant 200-Watt R40 Hi-Flood Lamp

A 200-watt R40 lamp with medium base that is designed to fit fixtures for 150-watt PAR lamps has been added to the line of H-Flood lamps marketed by the Radiant Lamp Corp., 300 Jelliff Ave., Newark 8, New Jersey.

The lamp is made of heat-resisting glass and has a sealed-in silver reflector which, it is claimed, does not require cleaning to maintain the maximum light output. The glass is said to resist moisture, sleet and vibration without cracking.

Add new finish beauty cut high finishing costs

with

"STYLON"

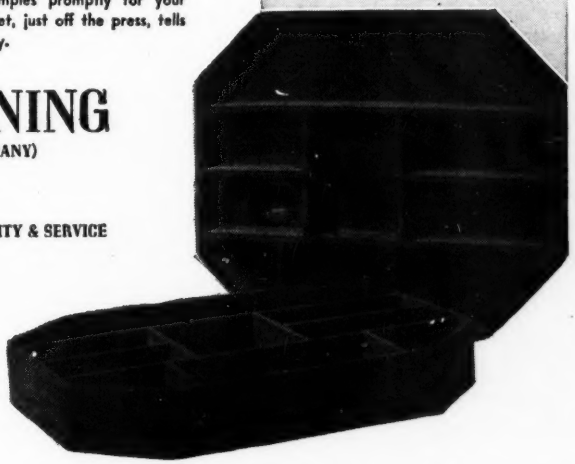
MICRO-CUT FIBERS

SELL and SAVE

For the "something new" that beautifies and sells — for the "something better" that shortcuts and saves — Stylonizing is the exciting new finishing method.

STYLON Fibers are micro-cut to exact length from new rayon tow, and are sprayed like lacquer on wood, metal or plastic materials. Stylonizing combines the beauty of color with the rich, soft look of velvet. It "hides" and "covers" magically. It deadens sound. It sells!

You can quickly appraise the utility of STYLON finishing for your product, without charge, by simply sending us samples for free Stylonizing tests. Our skilled product engineers will apply the proper STYLON finish in the colors you choose, make full recommendations, and return the samples promptly for your examination. Our new STYLON booklet, just off the press, tells the complete story. Write for your copy.



BEHR-MANNING

(DIVISION OF NORTON COMPANY)

TROY, N. Y.

76 YEARS OF QUALITY & SERVICE

Whatever your problem in finishing zinc or cadmium, there's an Iridite* to do the job. Iridite, a quick-dip, chemical treatment, offers you these three advantages:

1. EYE APPEALING FINISH . . .
On plated parts Iridite forms a long lasting, sparkling *bright* finish that *stays bright*, even after handling, storage, exposure. On all surfaces, Iridite can be used to produce a variety of colored finishes.

2. RUSTPROOFING . . .
Resistant to the attack of water, gasoline, and ordinary corrosive conditions, Iridite provides the ideal *final finish* for all zinc and cadmium surfaces.

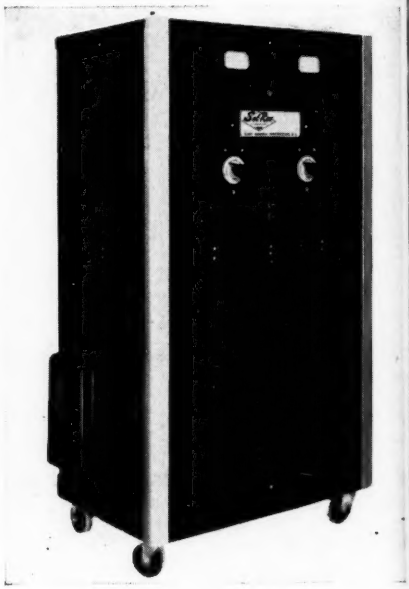
3. BASE FOR PAINT . . .
On any zinc or cadmium surface that must be painted, Iridite insures a better finishing system because the coating improves initial paint adherence, blocks corrosion *under* paint, blocks metallic soap formation *between* paint and metal.

Tell us the type of finish you need for zinc or cadmium — let us tell you how Iridite can help. For information and samples, write to:

ALLIED RESEARCH PRODUCTS, INC.
301 Chemical Building
4004 E. MONUMENT ST. • BALTIMORE 5, MD.
Manufacturers of
IRIDITE
DISTRIBUTORS IN PRINCIPAL INDUSTRIAL AREAS
*REG. U. S. PAT. OFF.

"Sel-Rex" 9-Volt 2,500-Ampere Selenium Rectifier

A 9-volt 2,500-ampere selenium rectifier recently added to its line of "Sel-Rex" rectifying equipment by the Bart-Messing Corp., 45 Morgan Ave., Brooklyn 6, N. Y., is primarily designed to provide a reserve of voltage for platers desiring to use diluted solutions of chromic acid



"Sel-Rex" 9-Volt 2,500-Ampere Selenium Rectifier

or other baths to conserve their limited supplies of critical materials. Tap switch control of the rectifier output provides for voltage adjustment without breaking the current to the plating tank.

The construction of the rectifier includes over 7,700 square inches of effective rectifying area (approximately 310 square inches per 100 amperes), the selenium elements being triple impregnated for corrosion protection. The rectifier is equipped with ball bearing fans, magnetic starter and push buttons, and Weston meters and shunt. It is Tygon lined and provided with positive overload protection.

Mounted on casters for mobility, the

For a High Safety Factor

the SPRINGS are of

SEYMOUR PHOSPHOR BRONZE

With the pressure on and temperature mounting in a modern hot water storage tank, everything depends on the reliability of the safety valve. Because positive and dependable operation is vital, Seymour Phosphor Bronze is a natural choice for the springs used in this assembly. Seymour Phosphor Bronze will undergo long-continued flexures and tension without loss of efficiency. Highly corrosion resistant, of excellent spring qualities, Seymour Phosphor Bronze is the ideal alloy where a high safety factor is imperative.

Seymour Phosphor Bronze is available in Sheet, Wire, and Rod. Write for catalog containing specifications.

THE SEYMOUR MANUFACTURING COMPANY, SEYMOUR, CONNECTICUT

SEYMOUR

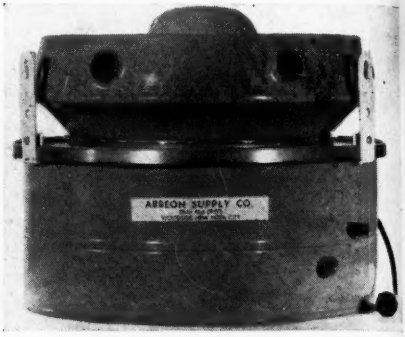
Sel-Rex 9-volt 2,500-Ampere Selenium Rectifier measures 69 inches high x 26 inches deep x 38 inches wide and can be operated on 220-440-volts, 3-phase 60-cycle current.

Walton Industrial Humidifier

An industrial humidifier which is said to require no steam, pumps, or compressors is now being marketed under the trade name of Walton by the Abbeon Supply Co., 58-10 41st Drive, Woodside, New York, N. Y. According to the manufacturer, the unit is noiseless in operation and completely self-contained, and is designed to atomize moisture in a vapor form finer than cigarette smoke.

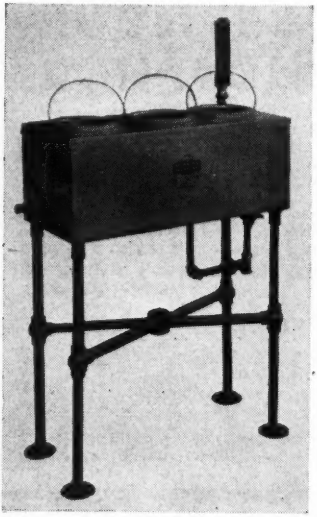
The lower pan of the humidifier is completely covered and air is drawn in from the bottom of the unit through a fiberglass filter. Equipped with hanging brackets, the humidifier can be easily installed by simply suspending it from the ceiling and running a single water pipe to the unit. No return water line is required. Automatic controls for the close regulation of percentages of relative humidity are supplied.

The Walton Industrial Humidifier has a vaporization capacity of over one gallon per hour, and can be furnished with



Walton Industrial Humidifier

a 300-deg., two-directional or single-directional dome. The unit is powered by a ball bearing motor, and all parts of the humidifier are made of heavy gauge copper or other non-ferrous material.



Unit stands 34" from the floor. Tank measures 26" long x 12" wide x 10" deep

It's New!

MULTIPLE POT GLUE STAND HEATED BY STEAM

Unit consists of three 2 quart copper glue pots—a stainless steel tank with a removable cover, mounted on pipe legs—necessary fittings for steam line, water supply and drain connections, also for thermometer and thermostat installations.

Glue pots have metal brush wipers across the top. Each pot has a handle for easy removal from the stand.

Water in the tank's jacket is heated by a stainless steel coil connected to external steam line. Volume of water in the jacket is controlled by water-line inlet, overflow standpipe and drain.

For more details, write

MUNNING

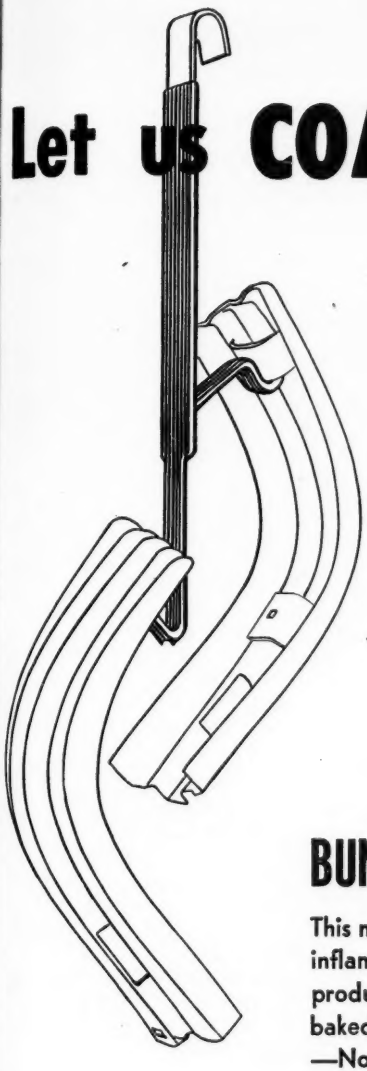
MUNNING & MUNNING, Inc.

Manufacturers of Electroplating, Buffing, Polishing Equipment and Supplies

202 - 208 EMMETT STREET • NEWARK, N. J.

Woolworth Building, New York City—Bourse Building, Philadelphia—190 Wyndham Avenue, Providence, R. I.

Let us COAT your racks



Paste insulation is thick and very tough and has long insulation life.

We are now prepared to give custom rack insulation service on any make or type of rack, using the new BUNATOL Paste Insulation. For long insulation life and freedom from trouble, Paste Insulation is the lowest in cost-per-hour of use. Ship your racks to Toledo for service.

NEW RACKS TO ORDER

Let us figure on your new rack requirements, with or without insulation. You are assured of correct design and construction to handle your production on the lowest cost basis. Get our prices on new racks.

BUNATOL PASTE INSULATION

This new insulation is 100% solids and contains no inflammable or evaporating liquid. A single dip produces a heavy thick coating which must be baked to convert to the solid form. No shrinkage —No loss. Reduced labor cost. If you have an oven to bake racks you can insulate your own racks profitably. Write for complete data.

NELSON J. QUINN COMPANY

Toledo 7, Ohio

Cut Costs, Increase Output with this Fast-Baking Oven

Despatch "RS" Finish Baking Ovens are very successful for repair shops and plants with small batches of products. Up to 50% faster baking . . . high volume air flow . . . approved safety system . . . gas or electric . . . moderate investment and low operating cost. Comes ready for operation—no engineer required to set it up.

Applications: For baking thermoset finishes on coils and stators; phenolic coatings on grills and unit assemblies; finish work on japans or lacquers; drying latex, ink, glues, asphalt; light core baking, dehydrating; preheating plastics, aging, and drying, etc. Fast curing or drying of synthetic films, dulux, lacquer, enamels.

Write for bulletin on RS-4 and RS-5 Ovens.

DESPATCH
Established OVEN CO. in 1902
327 DESPATCH BLDG. MINNEAPOLIS 14, MINN.

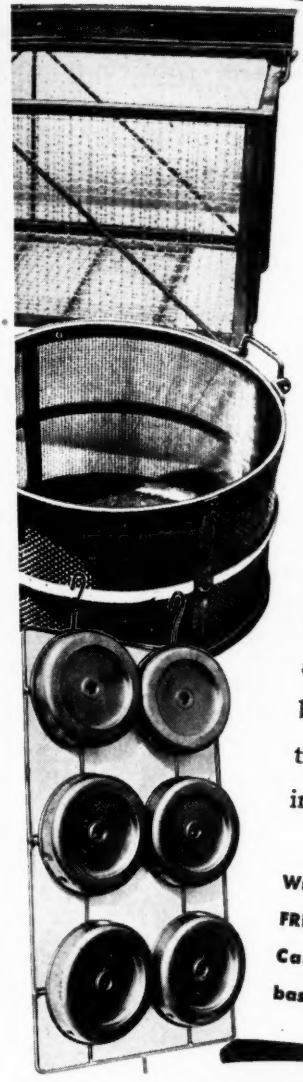
Ideal Tank Type Cleaner

A tank type cleaner for general vacuum cleaning, dust collecting, and water pickup is announced by Ideal Industries, Inc., 4004 Park Ave., Sycamore, Ill. Designed for easy operation, the unit is ruggedly constructed and includes a unique filtering system which is entirely self-contained. Incoming air is whirled around inside the tank and heavy particles are

Ideal Tank Type Cleaner

deposited therein. The air then passes through a cloth bag filter where the dust is removed. Collected dirt can be easily emptied from the cleaner by simply raising the vacuum sealed lid of the unit and then lifting out the 9-gallon tank and dust bag.

The Ideal Tank Type Cleaner is designed for easy movement over rough or smooth surfaces on its four 5-inch diameter wheels. The cleaner has a low center of gravity, with the motor unit mounted in the bottom so as to make the cleaner very difficult to upset. Swivel wheels in the front permit the unit to follow the hose with ease, and its small width clearance enables the cleaner to be moved



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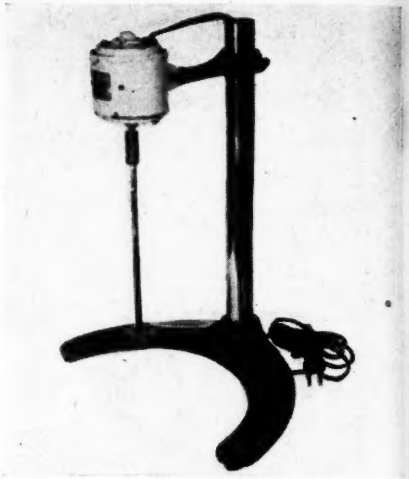
The Ideal Tank Type Cleaner is constructed of 16 gauge steel having a smooth Hammerloid finish and is powered by a 1½ h.p. continuous duty motor. A 30-foot primary cord provides for 2,700 square feet of coverage from one outlet.

Dayton Rogers Solution Stirring Mixer

The Dayton Rogers Manufacturing Co., 2835 12th Ave., S., Minneapolis 7, Minn., is now manufacturing an improved small stirring mixer for all fluids, including oils, chemicals, and so on. Designed to handle containers from 1-quart to 5-gallon capacity, the unit is equipped with a standard 110-volt 60-cycle a.c. motor with Underwriters' Laboratory approved electrical connection, and on and off switch.

The Dayton Rogers Solution Stirring Mixer includes a heavy cast base with rubber feet and 14-inch high upright. The motor bracket is adjustable for height and can be swiveled to provide for a 90-deg. vertical swing of the mixer. The shaft and impeller are made of stainless steel, and all parts are fully rust-proofed to eliminate rusting, corrosion, and so on.



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*"Kingcote"—a cotton flock trademarked under U. S. No. 423572, producing a suede effect at minimum cost.

MOHAIR, VELOUR AND VELVET SURFACE

"Raycote"—a flock composed of uniformly cut rayon fibres to produce on any surface a pile effect such as velvet, plush, or velour. Made under U. S. Patent No. 2014947.

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Detrex Triad PRD Spray Booth Coating Compound

Designated as Triad PRD, a coating compound for use on the walls of paint spray booths has been announced by the Detrex Corp., Box 501, Detroit 32, Mich. The compound can be used for facilitating maintenance on both wet and dry spray booths, but is said to have characteristics that make it especially advantageous for use on the walls of dry booths.

Triad PRD is a light-colored semi-liquid material that can be applied to the booth walls with a brush or spray gun. For spraying, a 20 per cent dilution (4 parts of Triad PRD to 1 part water) produces a viscosity that can be handled in a pressure tank. The material can be brushed on as supplied although a 10 per cent dilution with water usually provides a better consistency, it is claimed.

Upon drying, Triad PRD forms a continuous white coating to which paint spray adheres. When it is necessary to clean the spray booth, the coating of Triad PRD with the adherent film can be readily scraped off without previous soaking, or it can be easily removed by flushing with either hot or cold water.

Surbrite S and Surbrite H Steel Surface Conditioners

Two steel surface conditioners designated as Surbrite S and Surbrite H are now being marketed by the Hanson-Van Winkle-Munning Co., Matawan, N. J. These conditioners belong to the class of compounds broadly classified as acid inhibitors; that is, compounds to be added to sulfuric acid and hydrochloric acid pickling solutions. However, since they have the additional property of wetting or lowering surface tension and the ability to cause the pickled steel to develop a bright smut-free surface, they are designated as "steel surface conditioners."

According to the manufacturer, Surbrite S and Surbrite H are designed to save steel in that only the scale is attacked to any great extent; save acid because the acid ordinarily used in attacking the steel is not consumed; reduce hydrogen embrittlement, which occurs as the result of the hydrogen freed by the action of the acid on steel being absorbed by the steel during the pickling operation; and decrease hazards since a minimum of spray is produced, inasmuch as the amount of hydrogen formed is small.

Surbrite S and Surbrite H are said to

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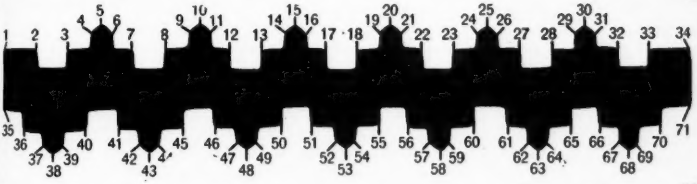

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be suitable not only for use in acid cleaning baths prior to metal finishing, but also for large scale pickling operations concerned with scale removal from hot rolled strip and steel forgings, stampings, and castings. Surbrite Foam is a spray eliminator to be used with Surbrite H and Surbrite S when very heavy pickling operations are being performed. This material, when added to the pickle bath, produces a foam which blankets the solution and prevents the escape of spray from the bath, it is claimed.

Interchemical Direct Reading Wet Film Thickness Gage

A gage for measuring the wet film thickness of paint, varnish, lacquers, and related products is now being made available under the trade name of Interchemical by the Henry A. Gardner Laboratory, Inc., Apparatus Division, 4723 Elm St., Bethesda 14, Md. Said to be accurate to within 0.0001 inch, the gage consists essentially of an eccentric center wheel supported by two concentric wheels, and is of a rugged high chrome content stainless steel construction which provides for easy cleaning.

Interchemical Direct Reading Wet Film Thickness Gage in use

According to the manufacturer, the Interchemical Wet Film Thickness Gage is designed to measure wet film thickness within a range of from 0 to 4 mils with an accuracy of 0.1 mil. In use, the operator simply holds the axle of the gage between the thumb and forefinger and rolls the gage over the wet film, reading the thickness directly on the calibrated engraved scale on the side of the outer wheel. The construction of the gage is such that film thickness measurements can be readily made on simple concave or convex surfaces.

Klem Metal Cleaner No. 159

Identified as the No. 159, a heavy duty still and soak tank cleaner of the fast acting type, recommended for all types of heavy duty cleaning of ferrous metals, is announced by Klem Chemicals Inc., 14401 Lanson Ave., Dearborn, Mich. Developed chiefly as a general purpose cleaner, the product is said to be particularly useful as a cleaner before galvanizing and porcelain enameling, as well as a soak cleaner before plating.

Economical to use, Klem Metal Cleaner No. 159 can be employed in low concentrations without impairing its efficiency. Cleaning procedure for soak or still tank requires a concentration of 6 oz. of No. 159 to a gallon of water. Concentrations can be increased or decreased to 4 or 8 oz. to the gallon, depending upon the speed required for the cleaning job to be done. Water temperatures should be held as near boiling as possible.

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Koroseal Laboratory Apron

A lightweight laboratory apron made of a flexible synthetic material known as Koroseal is now being offered by The B. F. Goodrich Co., Akron, Ohio. The apron consists of 0.006-gauge translucent Koroseal film, with cloth tape neck band and tie strings and hemmed edges. It measures 29 x 35 inches in size.

The Koroseal Laboratory Apron is claimed to provide resistance to most chemicals and oils, as well as excellent aging characteristics.

"Copeel" Strippable Plastic Coating

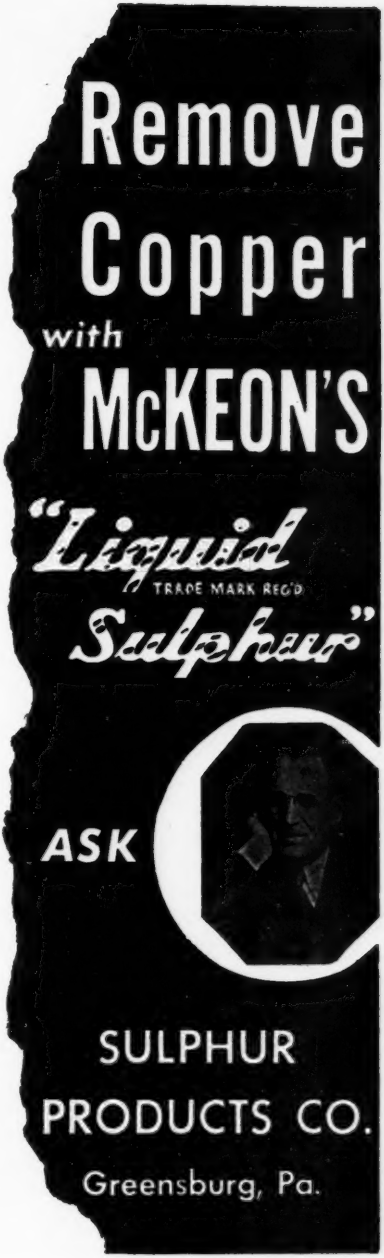
Designed to provide an envelope-type coating over bare metals and finished products to protect them from rust, corrosion, marring, and scratching, a strippable plastic material known as "Copeel" is now being manufactured by the Maas & Waldstein Co., Newark 4, N. J. Also water resistant, the material can be used to protect highly machined precision parts from rust and deterioration while in transit or in storage.

Copeel is available for hot or cold application and can be removed from the article simply by piercing the coating and then stripping like the skin of a banana.

Enthone Inhibitor No. 9

Identified as the No. 9, a liquid inhibitor that is designed to readily dissolve in acid solutions has been developed by Enthone, Inc., Dept. PF, 442 Elm St., New Haven, Conn. The inhibitor is claimed to be particularly useful where exhaust ventilation is not available. In solutions of both hydrochloric and sulphuric acid, the inhibiting action of the material is said to be over 90 per cent and in some cases ranging up to 98 per cent.

According to the manufacturer, Enthone Inhibitor No. 9 dissolves cleanly in the acid solutions, leaving no sludge or residue. As a result, the acid solutions can be easily rinsed off of the work. The inhibitor is available as a liquid which dissolves very readily in the pickling solutions, and is suitable for use in both cold and hot pickles. Steel coated with scale, oxide, and rust can be quickly pickled without attack upon the base metal, with the result that bright surfaces are left bright after pickling operations, it is claimed.



New Literature

Industrial Applications of Infra-Red. By James D. Hall. Published by McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 18, N. Y. 201 pages. Illustrated. Cloth binding, board covers. Price, $3.50.

Written from a practical point of view, this up-to-date volume shows the executive, supervisor, plant engineer, and so on, how to use infra-red radiation to obtain high quality and economical surface finishes. It also shows how to apply infra-red radiation to other industrial heating jobs.

The book describes available infra-red equipment, discusses its operating characteristics, and provides the essential design and installation data required to adapt infra-red to the specific requirements of the reader's own production processes. It covers the use of infra-red heat in such industrial fields as metal-working, paints, plastics, ceramics, and many others.

The book is divided into nine chapters which are headed as follows: Introduction; Advantages of Infra-Red Heat; The Incandescent Lamp as a Source of Infra-Red Radiation; Radiant-Heat Equipment; Planning and Design of Infra-Red Installation; Special Application Problems; Paints and Other Surface Finishes; Industrial Applications; and Miscellaneous Uses of Infra-Red Radiation. An appendix and index are included at the rear of the book.

A.G.A. Information Letter No. 15. A 16-page letter which is designed to furnish the industrial gas engineer with background material covering the field of finishing materials such as japans, lacquers, paints, and synthetic enamels, together with information regarding ovens for doing the work, has been prepared by the Committee on Heat Treating and Finishing with Gas, American Gas Association, 420 Lexington Ave., New York 17, N. Y. The first part of the letter covers the classification of finishes and definitions, and includes a description of the various drying processes. The second section provides data on oven design, oven atmosphere, and trouble check points.

Copy of Information Letter No. 15 is available free to individuals addressing requests on their company letterheads to the American Gas Association at the address given above.

"The Romance of Nickel" is the title of a 60-page booklet published by The International Nickel Co., Inc., 67 Wall St., New York 5, N. Y., featuring the history, production, and uses of nickel and its alloys. The contents of the book are divided into four parts as follows: "Nickel Down Through the Ages;" "How Nickel Is Produced;" "What Nickel Is Used For;" and "Research and the Future." Pen and ink drawings supplement the text throughout the booklet so as to add to its interest.

Executives desiring a copy of "The Romance of Nickel" should address their requests on company letterheads.

"Presto" Buffs. A four-page bulletin published by The Manderscheid Co., Dept. 101, 810 Fulton St., Chicago 7, Ill., illustrates and describes a complete line of bias type, loose, concentric sewed, spiral sewed, and other buffs. Also included is information on recommended buff usage, construction details, and available sizes. Copy of Bulletin 160 free upon request.

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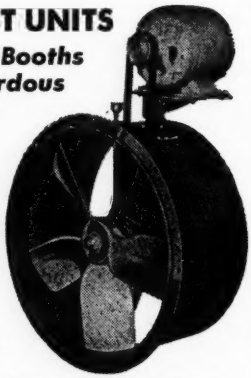

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Murco Tumbling Barrel for deburring, burnishing, cleaning, polishing, and smooth-surfacing metal and plastic parts on a mass production basis is illustrated and described in a catalog sheet now available free from the D. J. Murray Manufacturing Co., Wausau, Wisconsin.

"Drying Problems Made Easy" is the title of an eight-page brochure released by the North American Electric Lamp Co., 1020 Tyler St., St. Louis 6, Mo., which features Nalco "Dritherm" Industrial Infra-Red Lamps. Illustrated and diagrammed, the brochure details the flexible use of the lamps in relation to drying, curing, dehydrating, preheating, expanding, and high heat concentration. Actual lamp installations are shown covering a wide variety of industrial application. Copy of Brochure No. 8 free upon request.

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Novelty Finishes Color Deck. In order that industrial designers, design engineers, stylists, and others whose job it is to select the correct finish for a product can better visualize beforehand how a certain finish will actually look, the Maas & Waldstein Co., 438 Riverside Ave.,

Newark, N. J., has prepared an unusully large color deck. This helpful finish selector guide contains 27 different color chips, each measuring 3 x 5 inches, and shows a variety of lacquers, enamels, and synthetics. It is available upon written request on company letterhead.

DuBois Solvent Booklet. The DuBois Co., 1120 W. Front St., Cincinnati 3, Ohio, has released a four-page booklet listing the various petroleum, aromatic, and chlorinated hydrocarbon solvents commonly used in metal cleaning. Tabulated data on flash points, boiling ranges, chemical constitution, toxicity, and other important factors are provided to facilitate the selection of the correct solvent for a particular job. The booklet discusses the use of emulsifiable solvents and emulsion cleaning, as well as the effect of the various solvent groups on particular soils. Flash points are also given on each of these solvents mixed with Actusol, an emulsifiable oil detergent. Copy of booklet free upon request.

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Cover's Dupor Respirators and Gas-tight Goggles. A 12-page booklet prepared by H. S. Cover, South Bend, Ind., presents illustrated and descriptive information on a complete line of respirators for nuisance dusts and gases, paint spray, lead, smoke, and so on. Gas-tight and fog-proof goggles are also shown and described. Copy free upon request.

"A Simple Solution to the Problem of Industrial Noise" is the title of a six-page folder prepared by the Industrial Products Co., 2820 N. Fourth St., Philadelphia 33, Pa., which illustrates and describes the Sepco Ear Protector and its effectiveness in industry. Copy free upon request.

Burdett "Infra-Red" Gas Systems. The Burdett Manufacturing Co., 3433 W. Madison St., Chicago 24, Ill., now has available a 12-page circular which illustrates and describes infra-red gas systems for paint and varnish drying, degreasing, baking, evaporating, and other operations. Typical installations of the systems are depicted and briefly discussed. Copy free upon request.

"Preparation of Aluminum Surfaces for Painting." A special phosphate-type conditioning treatment for removing light soils and preparing aluminum surfaces for painting and other organic finishing is described in a four-page illustrated service report issued by Oakite Products, Inc., 32F Thames St., New York 6, New York. The report fully discusses this phosphatizing treatment as provided by Oakite Compound No. 36, a mildly acidic material, which is said to perform the following functions: (1) effectively remove light oils, grease, and shop dirt from aluminum and its alloys: (2) microscopically etch aluminum surfaces and form a thin, inert, adherent phosphate film which leaves surfaces in good condition for grippage of paint, lacquer, and enamel coats; and (3) retard corrosion of the metal under the paint coats should they become accidentally scratched or damaged. Complete information on methods of application, recommended concentrations, solution temperatures, and so on, is included in the report, copy of which is available free upon request.

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